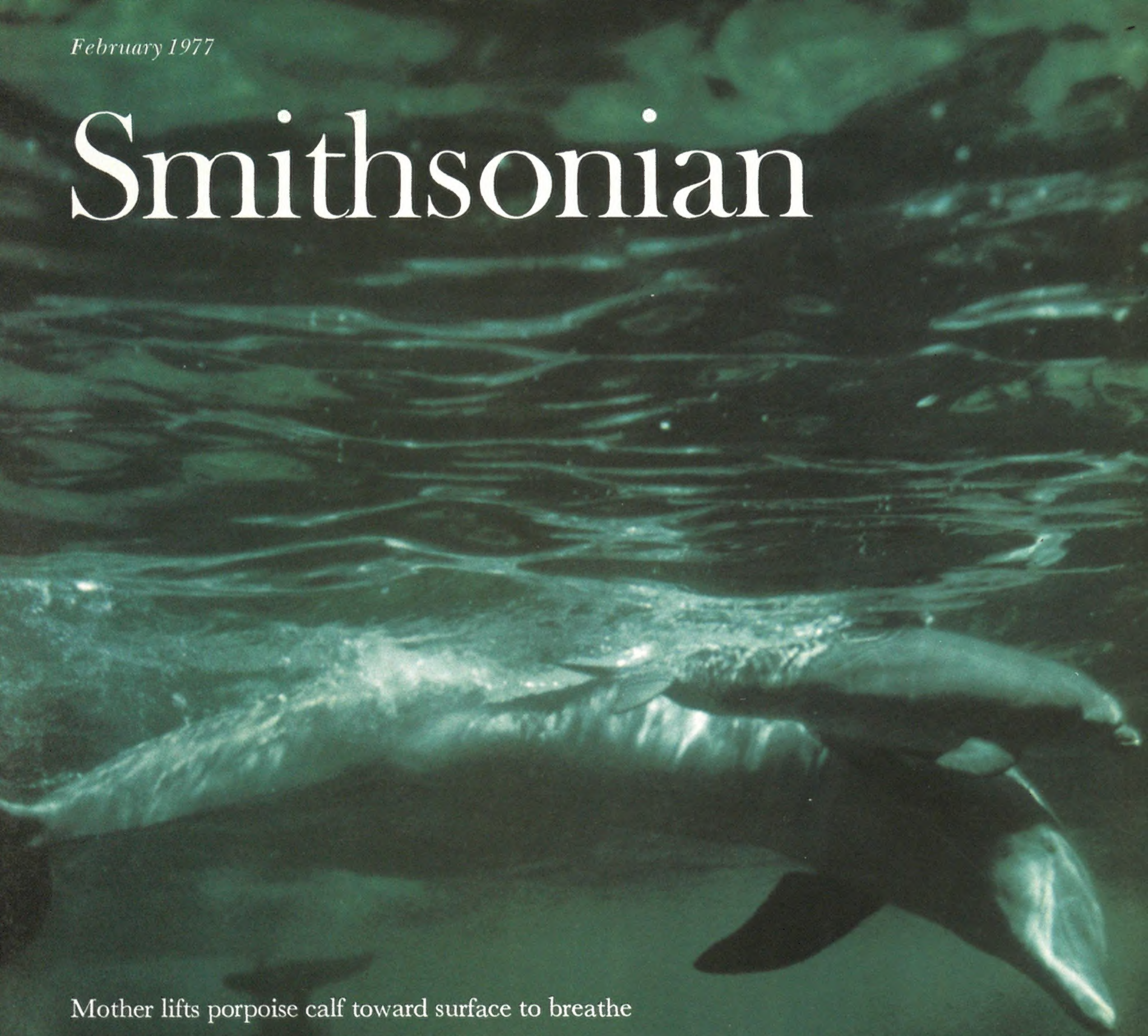
February 1977

Smithsonian



Mother lifts porpoise calf toward surface to breathe

The fight to save porpoises from death in tuna nets (p. 44)

Unmistakably Johnston & Murphy

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At left: The Taos, mink brown suede handsewn moccasin with gold saddle ornament, $85.00. Also available in black and dark brown calf.

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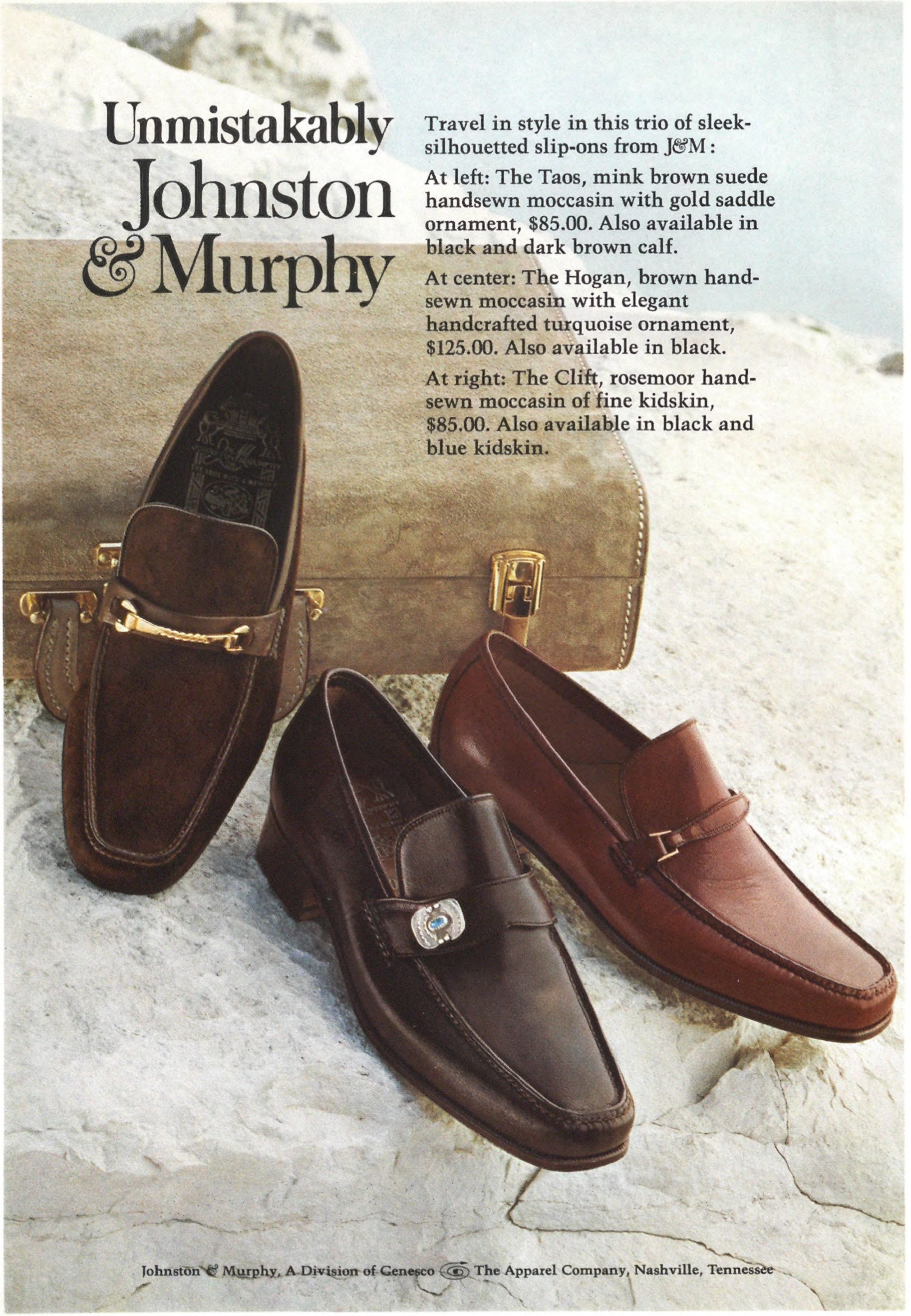

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Smithsonian

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Secretary Ripley's comments

The view from the castle

Beauty and mystery take the breath away in contemplating Tut's treasures, but today's imperial burials evoke little awe

Today I looked at a scarab that I had bought in Egypt when I was ten years old. Whether it is really old or not is immaterial. It connotes for me the passage of time, the rising of the sun each day as surely as the beetles continue to roll their balls of dung. As T. S. Eliot put it in *Burnt Norton,* the first of his *Four Quartets:*

Time present and time past
Are both perhaps present in time future,
And time future contained in time past.

The extreme popularity of the current loan exhibition of relics from the tomb of Tutankhamun (SMITHSONIAN, November 1976) is particularly fascinating. People stand in long, patient lines at the National Gallery of Art in Washington, just as they stood outside the British Museum in 1972 and as they will in the five other American cities where the treasure will be shown during the next two years.

Of course, the exquisite beauty of the objects, the richness of the gold, the glowing colors of the inlays, the skill of the modeling, the figures of animals in fascinating detail—these evidences of the persistence of human creativity from a time more than 3,000 years ago are breathtaking. To realize, besides, that some of these things were already old in part, and that Egyptian skill in carving stone had already preceded the 18th Dynasty by some 2,000 years, seems inconceivable to us who have just celebrated the Bicentennial of the Republic. What would the incarnation of Amun-Re have thought of that?

When, the first time, I rode on a donkey through the dry wadis leading to the Valley of the Kings, the trip seemed to take all day, and I recall reveling in the sense of unimaginable time passing. Those sand larks were still there then, drifting away up the hillside like minute dust devils, and the loud, bursting call of the pink trumpeter bullfinches must have echoed round the stonework of the tomb entrance then as now. Thinking back to that time of my own youth, I remember that potsherds from the Roman occupation still peeped from the sandbanks and, in the desert, worn tree stumps testified mutely to life many thousands of years before. Looking at Tutankhamun's portrait heads, whether in gold or in polychromed wood, one sees something more than beauty. There is a mystery involved—and a sense of recognition. We have been here before.

Even though the sight of such beauty coupled with imagination carries one away, I have a feeling that something quite different is at work here. It is not the same when one contemplates Lenin preserved in his granite tomb, nor will it be the same, I suspect, should we contemplate Chairman Mao Tse-Tung in his crystal sarcophagus.

There is much that is similar in these imperial burials, whether of the past or the present, but also much that is different. The 20th-century ones evoke little awe. Perhaps they are merely too contemporary—and of course they are not beautiful, either. But in Egypt the sense of time has a magic of its own. Here we have the feeling that we have been part of time past, and a sense of the inevitability of time future, as the scarab beetle makes his trails across the sand.

S. Dillon Ripley

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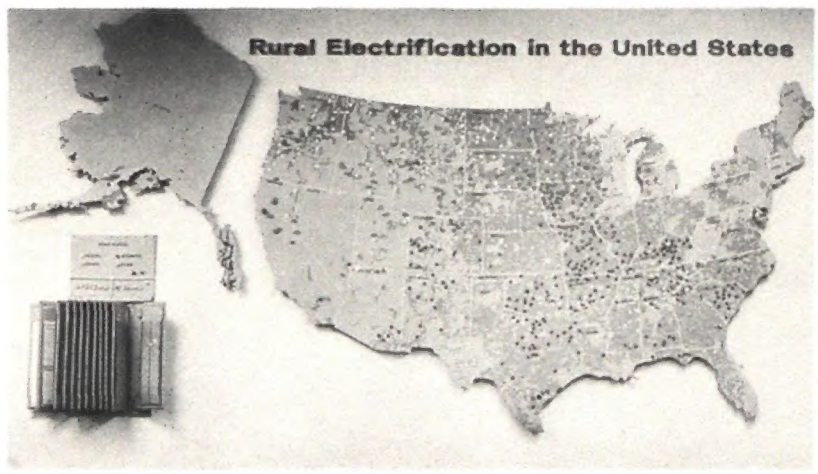

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We've said it before; we're saying it again. The longer we delay development of a comprehensive national program to ensure adequate energy for the future, the more unmanageable the problem becomes.

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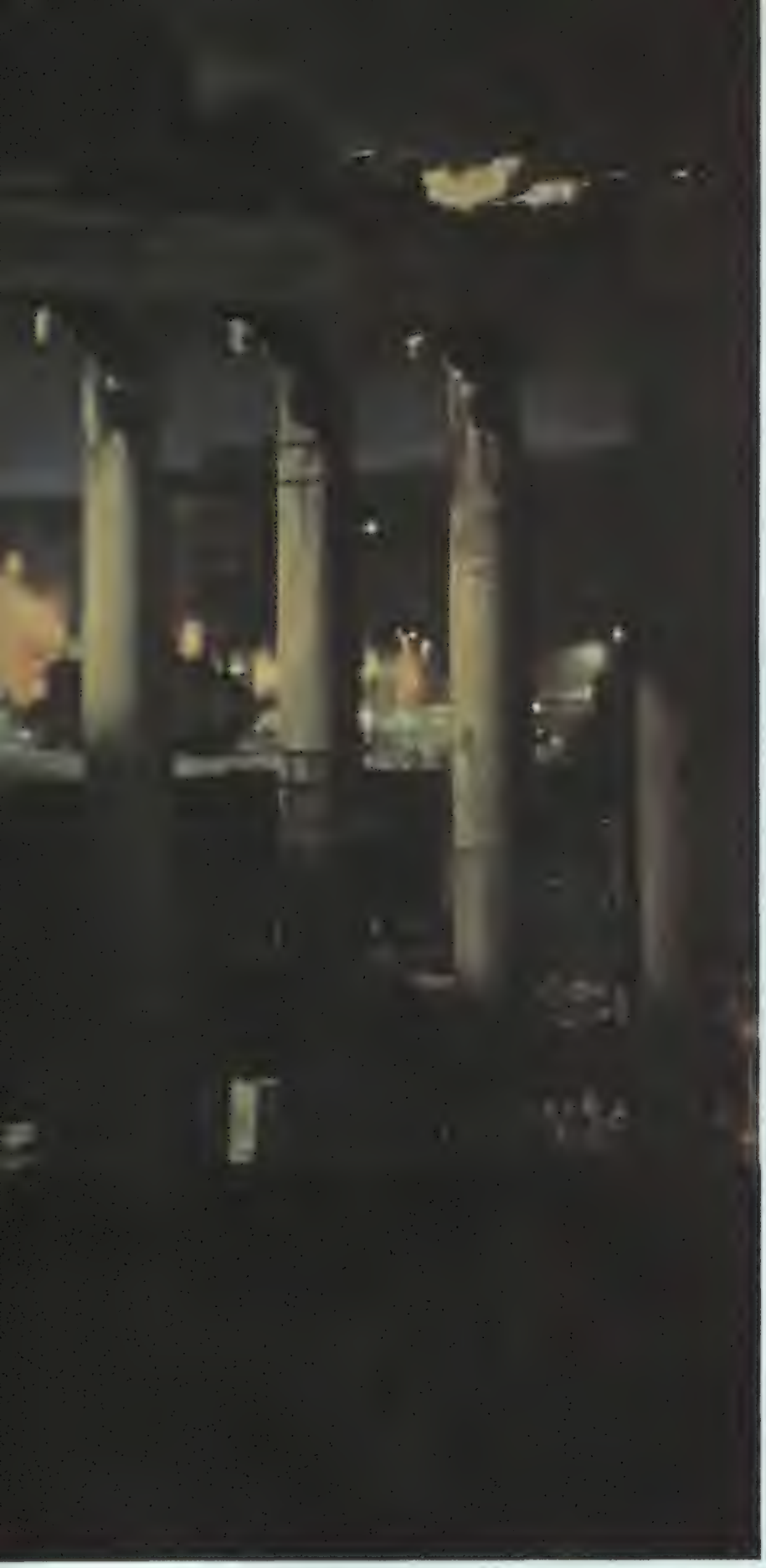

commemoration. And a unique collection of *medallic cachets* will be created to honor these world-renowned sites. Appropriately, there will be 100 cachets in the collection, each containing a finely sculptured sterling silver Proof medal portraying one of the world's greatest landmarks.

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Mr.
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Phenomena, comment and notes

Fragmentation of American family, increasing complexity of terrible lizards, science blowing hot and cold

To an outsider observing the field, there are two kinds of science—hard and soft. Hard science is the kind that is experimentally verifiable so that even a layman can understand its powerful truth. Soft science is the kind where nothing much is certain even after long exercises in reasoning and data processing.

The physicist and the chemist seem examples of hard scientists, while psychologists and sociologists best represent the soft side of science. Biology fits somewhere in between. Biologists can be pretty certain that *x* will happen to an organism if they do *y* to it, but at the same time their technological brethren, the people of the medical profession, seem pretty soft on an awful lot of subjects, like swine flu vaccine.

There is another distinction to be made between hard and soft sciences: hard sciences are generally optimistic ("We have just isolated the enzyme bionucleoacetatophile cardboardius which, we have reason to believe, is the cause of mental disintegration") whereas the soft sciences are generally pessimistic ("The conclusions we have reached from our stochastic analysis of senior class members graduating from Midwestern junior colleges and whose names begin with the letter R is that we may face a generation of nontaxpaying heterosexuals with no savings accounts and no interest in industrial design.") Those social scientists, by

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A remarkably intact specimen from South Africa of *Heterodontosaurus tucki,* a bit of spanner in the paleontology works.

the way, who are optimistic get into high government positions and, as a result, lose their tenure at the university, and then wind up running for the U.S. Senate.

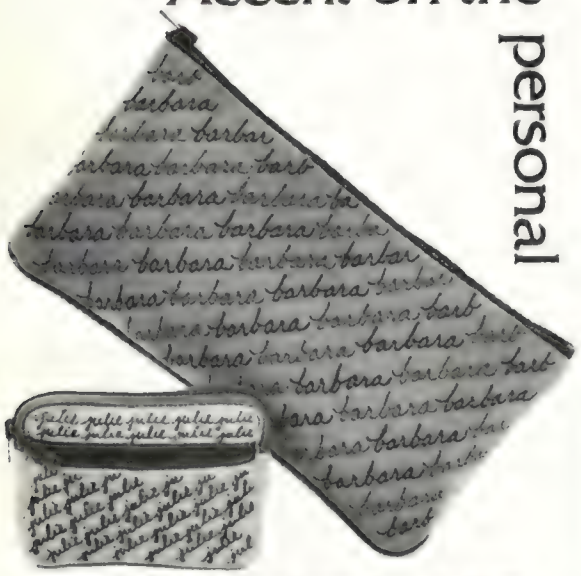
In any event, quite aside from science, it is now February in the nation's capital, the worst possible time of year, so one is inclined to believe the soft scientists that nothing really works and nothing really improves. The sense of pessimism slops over even to the natural (semihard) science of paleontology at this time of year.

Found and lost

Paleontologists have just reported on a remarkably complete fossil specimen of *Heterodontosaurus tucki,* a dinosaurian creature of the Late Triassic Age. Prior to this, paleontologists have had almost exclusively only heads of *H. tucki* to analyze. Now, with most of the postcranial anatomy available to them, they have found that nothing is simple. In several characteristics, this creature is far too complex; it has evolved further than anyone had previously thought.

The result of this analysis is that dinosaurian evolution has become more com-

Accent on the personal



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plicated than was previously thought. And so, as reported in *Nature* (Volume 264, Number 5584), "the poor paleontologist searching for answers is therefore, in the origins of the dinosaurs, confronted with complexity where he hoped for simplicity. . . ."

Of course, one can consider this good news if one is a paleontologist, since a further obscuring of the origins of dinosaurs is, *mirabile dictu,* a further reason for the work of paleontologists. But for those seeking simple answers in the cold damp of February, this sounds a bit soft.

A family affair

On the other hand, the soft sciences begin to sound harder and harder. Consider the findings of Urie Bronfenbrenner, a child-raising expert, reported in *Search* (Volume 2, Number 1). His figures concern youth, and these in turn concern the state of the American family, which we are told is about to become a matter of urgent statecraft. If this is true, it is none too late. Here are Mr. Bronfenbrenner's figures and a few of his conclusions:

In the 1920s, 50 percent of homes in Massachusetts had a third adult (aunts, grandfathers, what not) living in the house. Today the percentage is only five.

Today, a majority of families with school-age children have working mothers —that is to say, most kids are latchkey children. In 1975, 39 percent of mothers with preschool children were working. One out of six children in the United States lives with one parent. Thirteen percent of all infants under three live with one parent. The divorce rate is nearly three times that of 1950. In growing numbers of divorces, neither parent is willing to take on the children.

Furthermore, parents are demonstrably spending less and less time in direct relationship with their children. One study of middle-class fathers of one-year-old infants "found that they spent an average of only 20 minutes a day with their babies." But when a microphone was installed, the true period of interaction proved to be 38 seconds a day.

The increase in crime by children is three times that of adults in the past 15 years—they accounted for one-fourth of all arrests in 1973. Young people's suicide rate has more than tripled in the last 20 years—suicide is now the third leading cause of death among young American whites. Half the unemployment of our nation is among people under 25.

Now that's a lot of hard figures. And what are we to do about them? Here, along with his fellow social scientists, Mr. Bronfenbrenner goes soft: parents should be less individualistic, we should reshape the sociotechnical structure of society so that it doesn't fragment us, and we should write federal laws so that they support the family rather than undermine it.

We must all applaud such sentiments, cower in horror over such statistics, and wonder, after all, *what* precisely we are supposed to do? After all, nowadays we can't even tell our children where dinosaurs came from.

A blow for preventive medicine

Now that those ignorant armies known as football teams have ceased clashing every weekend and the passions of the faithful are, if not satisfied, at least extinguished, it may be possible to point out some facts about the game without starting a fight. The facts arise from a study

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commissioned by the National Football League itself, which the league is apparently none too anxious to disseminate.

Acting in the finest tradition of investigative journalism, *Medical World News* (Volume 17, Number 25) reveals that helmets and shoulder pads, as presently designed, are dangerous weapons. The Stanford Research Institute studied 1,000 NFL injuries in 1974 serious enough to force a player out of the game; that is more such injuries than there are players in the league. More than 20 percent of them were caused directly by contact with a shoulder pad or helmet. The obvious solution: equipment that is padded on the outside as well as the inside. But in sports nothing is simple.

Coaches say that a soft helmet causes neck injuries for the wearer since it doesn't slide off the opponent as well as a shiny, hard-shelled helmet. To counter this argument, soft helmet supporters point to the experience at Cornell where soft-shelled helmets, in use for 20 years, led to no perceivable increase in neck injuries, but pro coaches remain unconvinced. One doctor, involved in the controversy, suggests that the problem is that padding softens the noise "and the coaches can't hear the big thunk. The coaches love that noise." And coaches reply that doctors don't know anything about football.

Wonderland 1977

While there *is* a football draft, it is not the same thing as the Selective Service. Football players are volunteers. However, Americans—all of us—are conscripted willingly or not into a situation where one out of five dies of cancer.

That emotion-laden statistic arises from a cool, unemotional review of environmental cancers by Eula Bingham, a toxicologist at the University of Cincinnati and a frequent consultant to the federal government.

An article in which Dr. Bingham is interviewed, in *Environmental Science and Technology* (Volume 10, Number 13), states that 90 percent of all cancers are probably caused by environmental factors and a substantial portion of these factors are chemicals. That means that most cancer is preventable.

There is a trend, albeit a weak one, notes Dr. Bingham, toward prevention: the much-delayed passage of the Toxic

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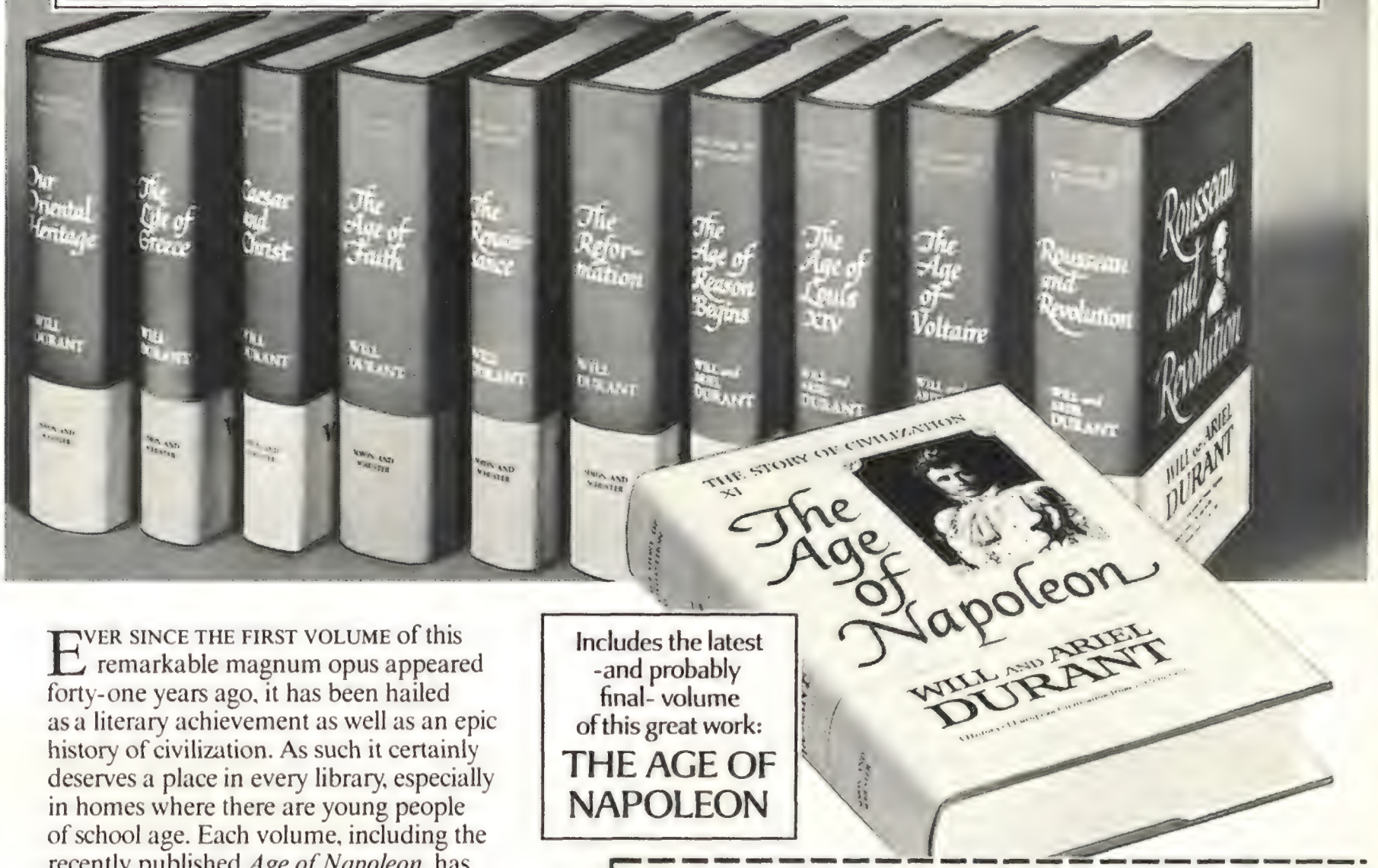

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Substances Control Act of 1976 is a case in point (and still a sore thumb on the body politic and economic). But, trend or no trend, there have been 35 years of dumping untested, unregulated chemicals into our environment, many of which are carcinogenic and many of which, though relatively harmless themselves, can combine with other chemicals in unknown ways to become carcinogenic. It is claimed that we are entering "the carcinogenic century," trend or no trend in our efforts at prevention.

The National Cancer Institute (which has been charged with finding a quick fix for this matter) currently spends only 15 percent of its approximately $700 million annual budget on research into the environmental causes of cancer.

The fact is that the question is more often than not put in terms of economics. One estimate of the cost of ridding the environment of pollution (of which some is carcinogenic) is as high as $263 billion between 1974 and 1983. That's $815 per household in the year 1983. Who would stand for such a tax?

There is also a bitter argument under way about whether antipollution efforts eliminate jobs. In some cases they do; in other cases they create jobs. No one is sure about what is fashionably called the bottom line. And the chemical industry quite properly points out that a great deal of what we consider the quality of our lives derives from their efforts, no matter how those same efforts may affect the quality of our deaths.

Without a job, we are informed, there can be no dignity. But what dignity is there in doing a job that creates carcinogens? Is the dollar cost of prevention worth the $15 billion annual direct cost of cancer (much less the cost of the suffering)? Who is to say? Economics seems to be at a loss to arbitrate such questions, but cannot one have faith that the best economic minds of the country could, if ordered to do so, devise a new economics whereby health and industrial well-being could be more closely allied? It would seem a worthy challenge for the country's third century.

Meanwhile, one watches the joggers running about behind the exhaust pipes clogging the highways, seeking health and gulping noxious gases in the same act, and one feels that Alice's Wonderland had nothing on us.

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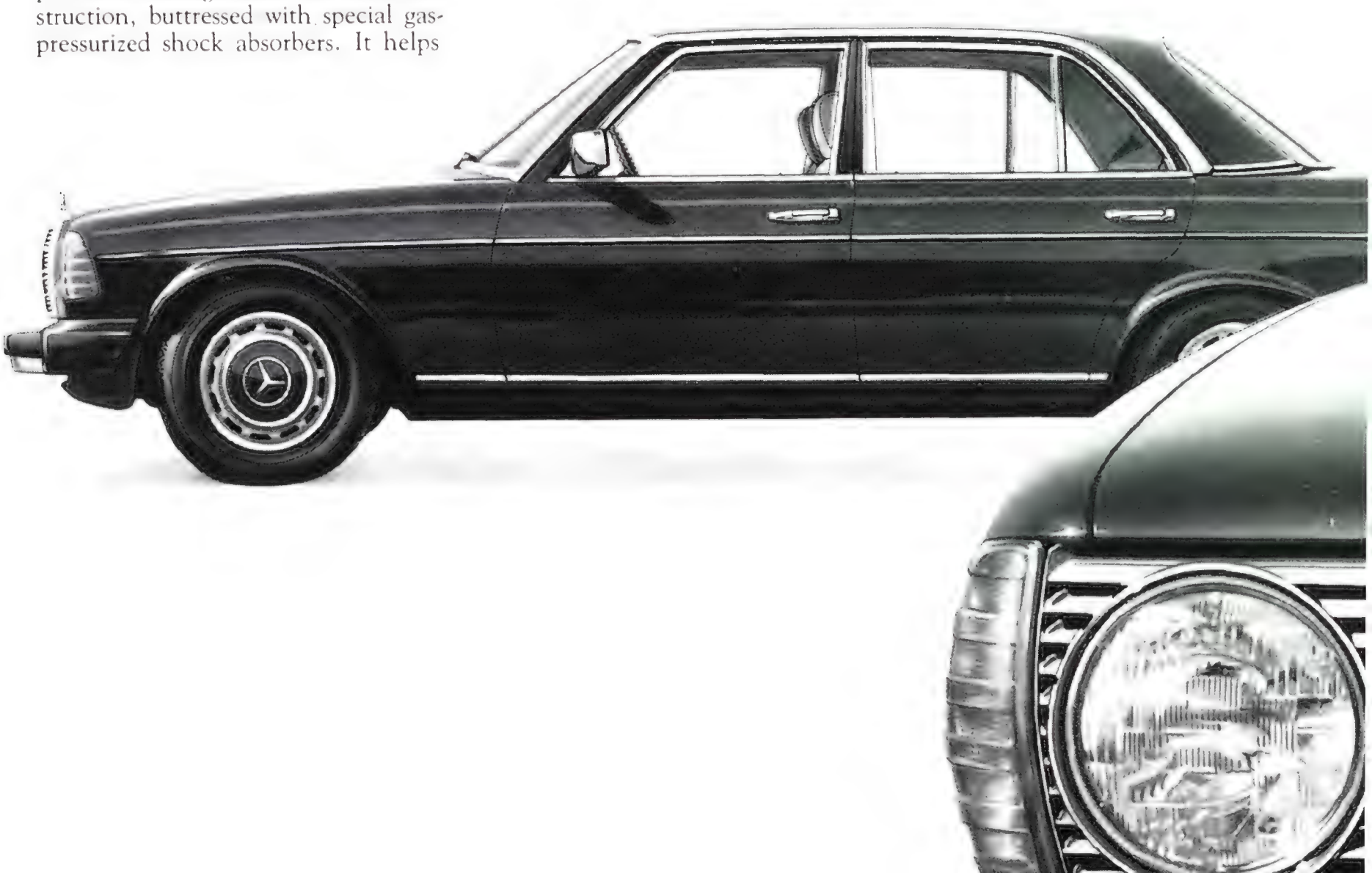

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Letters to the Editor

Robert Osborn and air history

Dear Sir: I read Keith Wheeler's article, "Lighthearted view of serious air history: by Osborn, natch" in your December issue, with great delight. I have been an Osborn fan since very early in World War II. I was then the superintendent of aviation training at Corpus Christi when Artie Doyle sent Osborn to us to collect cadet mistakes for his Dilbert. I don't remember trying to teach him to fly, but we had enough cadet errors to keep Osborn's pencil busy without forcing *him* to break things up.

I assigned Bill Riley, a busted cadet awaiting a ground commission, as his guide. Very soon Dilbert had a nose like Riley's. I wonder why Grampaw Pettibone never looked like Seth Warner.

George van Deurs
Rear Admiral, U.S. Navy, retired
Belvedere, California

Dear Sir: Since I'm working on a book on the *F6F Hellcat* and have reviewed my research regarding one episode Osborn mentioned, I believe the pilot whose name Osborn could not recall was Lieutenant (jg) John R. Ivey of Fighting Squadron 15 which was based aboard *Essex*. But the action occurred off Iwo Jima, not Saipan, on June 16, 1944. Ivey's *Hellcat* was hit by antiaircraft fire while strafing the island's airfield. His wingman and another pilot tried to guide him back to the ship, but were ordered to land aboard when it became obvious Ivey couldn't get down. Another *Hellcat* followed Ivey and reported that he had crashed at sea.

Barrett Tillman
Athena, Oregon

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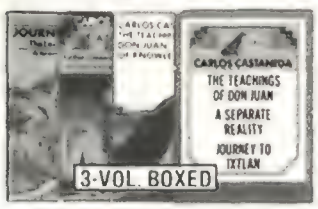

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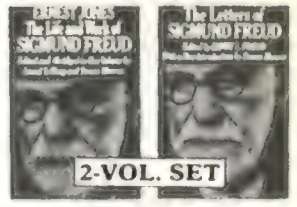

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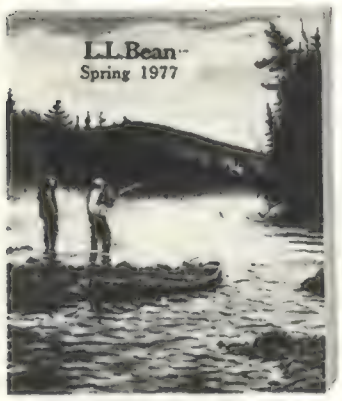

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Artist Sivard re-creates capital

Dear Sir: I thoroughly enjoyed Rod MacLeish's article on the paintings of Robert Sivard's early Washington. But I feel one statement needs a little clarification. The caption under the picture of Mrs. Surratt's boardinghouse reads: "A Chinese grocery is now on the site." This leads one to believe that, like some of the other sites pictured, this building no longer stands. You should have gone further [see below] to explain that this building still stands, now 604 H Street, N.W., in the heart of Washington's Chinatown. The front steps and second-story entrance have been removed, and the bottom floor converted into a Chinese grocery store named "Suey Sang Lung."

In 1968, the Surratt house was designated a category III landmark, and it was suggested that "with proper restoration, this historic building could become a significant tourist attraction and contribute to the revitalization of the Seventh and H Streets neighborhood."

Didn't I spot Lewis Payne, Booth's henchman and the would-be assassin of Secretary of State William Seward on the sidewalk, just beneath Mrs. Surratt?

Richard Sloan
The Lincoln Log Newsletter
Seaford, New York

Yes, Payne, wearing brown coat and hat, is facing the street. Ed.

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Dear Sir: Much as I enjoyed Robert Sivard's painting of early Washington, I do not long for the good old pre-air conditioning days when my ancestors sweltered in attics of white people's homes. Being black, I do not long for the rerouting of freeways so that relics such as the Peter home on K Street can be saved.

Your article says the period depicted is shortly before George Washington's death [December 14, 1799], yet there are autumn leaves clinging to the one tree. Granting that it might have been a gorgeous Indian summer day, both neatly dressed white children in the picture are wearing shoes but the black stable hand (doubtless a Peter family servant) is barefoot. How cold did it have to get before black servants wore shoes?

P. H. Garrettson
Washington, D.C.

Dear Sir: How great you are to give me this view and memory of Stuntz's toy shop and the Washington of my childhood. Pennies at Stuntz, nickels on the horse bus. A grand reminder and Christmas present!

Mrs. Francis G. A. Millar
Malvern, Arkansas

Alexander Calder

Dear Sir: After seeing "Calder's Universe" at the Whitney just a few weeks ago, I was doubly pleased with your article. One minor correction, however: As the daughter of a Stevens graduate, please be advised that the Stevens Institute of Technology is in Hoboken, not Newark as listed in your article.

Judith L. DeScenza
Bayside, New York

Miss DeScenza is correct. Ed.

Water buffalo

Dear Sir: Thank you for Noel D. Vietmeyer's heartwarming article on the water buffalo. We lived near Cairo, Egypt, in the 1950s, when my husband was financial adviser to the government from the United Nations, and we drank buffalo milk, ate buffalo butter and cheese, poured the thick white cream into coffee and over desserts. The familiar sight of grazing buffalo herded by women or children along grassy verges of canals was brought back vividly by the article and photographs.

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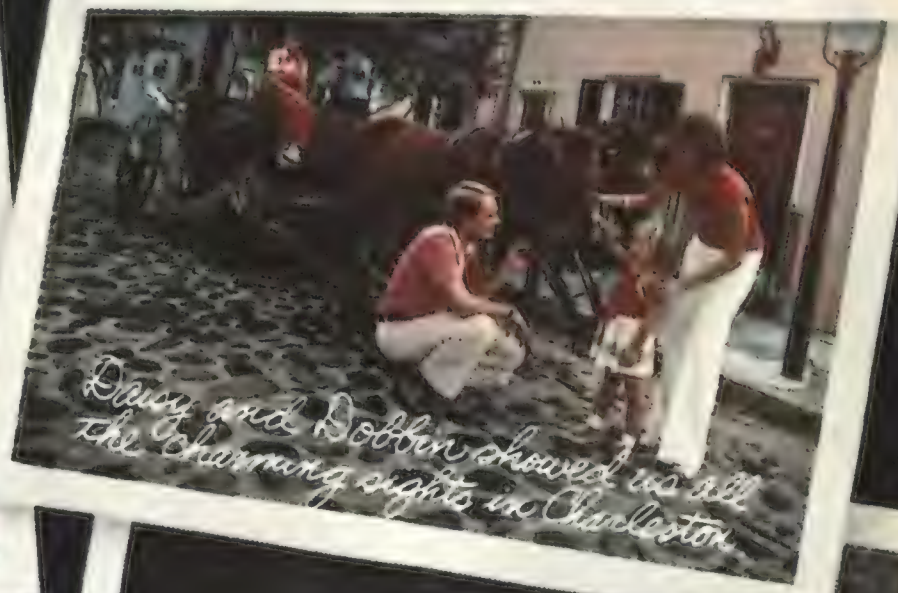
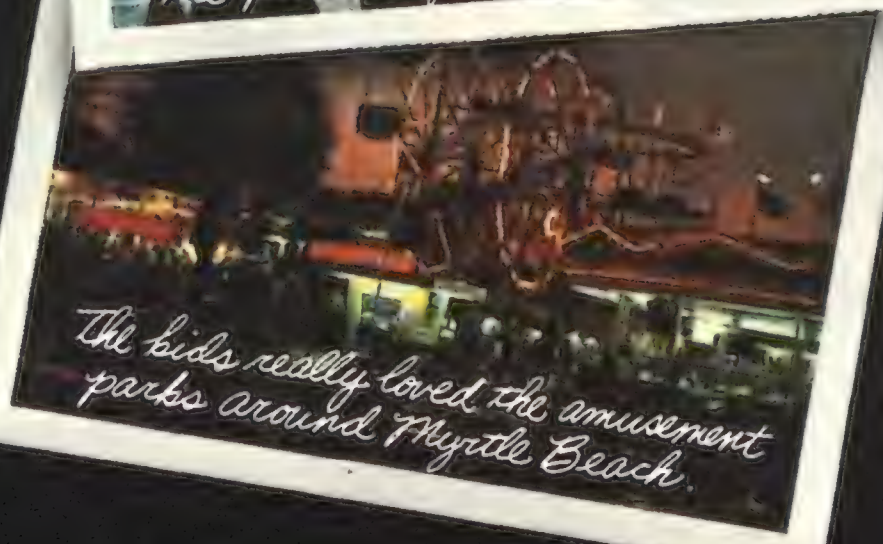


Daisy and Dobbin showed us all the charming sights in Charleston.



The kids really loved the amusement parks around Myrtle Beach.

It was a beautiful day for us. (Bill sank this putt for a [illegible])

We're going back to South Carolina this year. There was much too much for us to see and do on one vacation. We'll visit the sea islands, the zoo near Columbia and this time I'll manage to squeeze in a little shopping.

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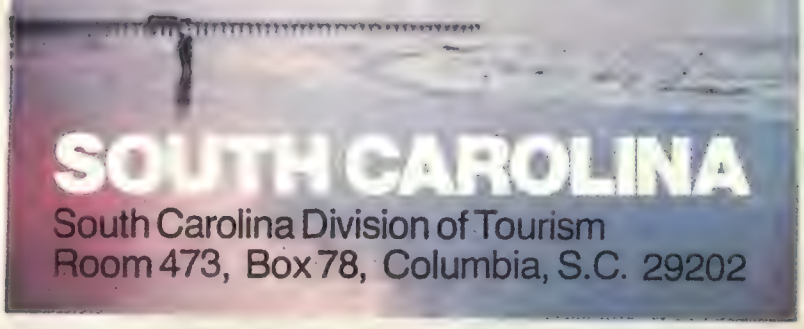

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We felt quite defensive about the animal when an adviser arrived in Cairo from the U.S. "Point Four" program and immediately declared, "the gamoosa must go!" I've been waiting years for this goodhumored and informative vindication of the gentle gamoosa.
Janet W. Witter
Milwaukie, Oregon

Dear Sir: During World War II, as we moved inland from Salerno, one of the first things we saw was a small herd of water buffalo, placidly taking their ease at water holes. Since I was at that time a company commander, and had read somewhere that water buffalo were ferocious, I cautioned the men to beware. One corporal spoke up and said, "Captain, they ain't going to hurt nobody." And it turned out he was right.

We were in the Salerno area about two weeks, and I never heard of anyone tangling with a water buffalo. They just ignored us. I assumed they belonged to farmers who had beat a hasty getaway.
B. D. Burks
Silver Spring, Maryland

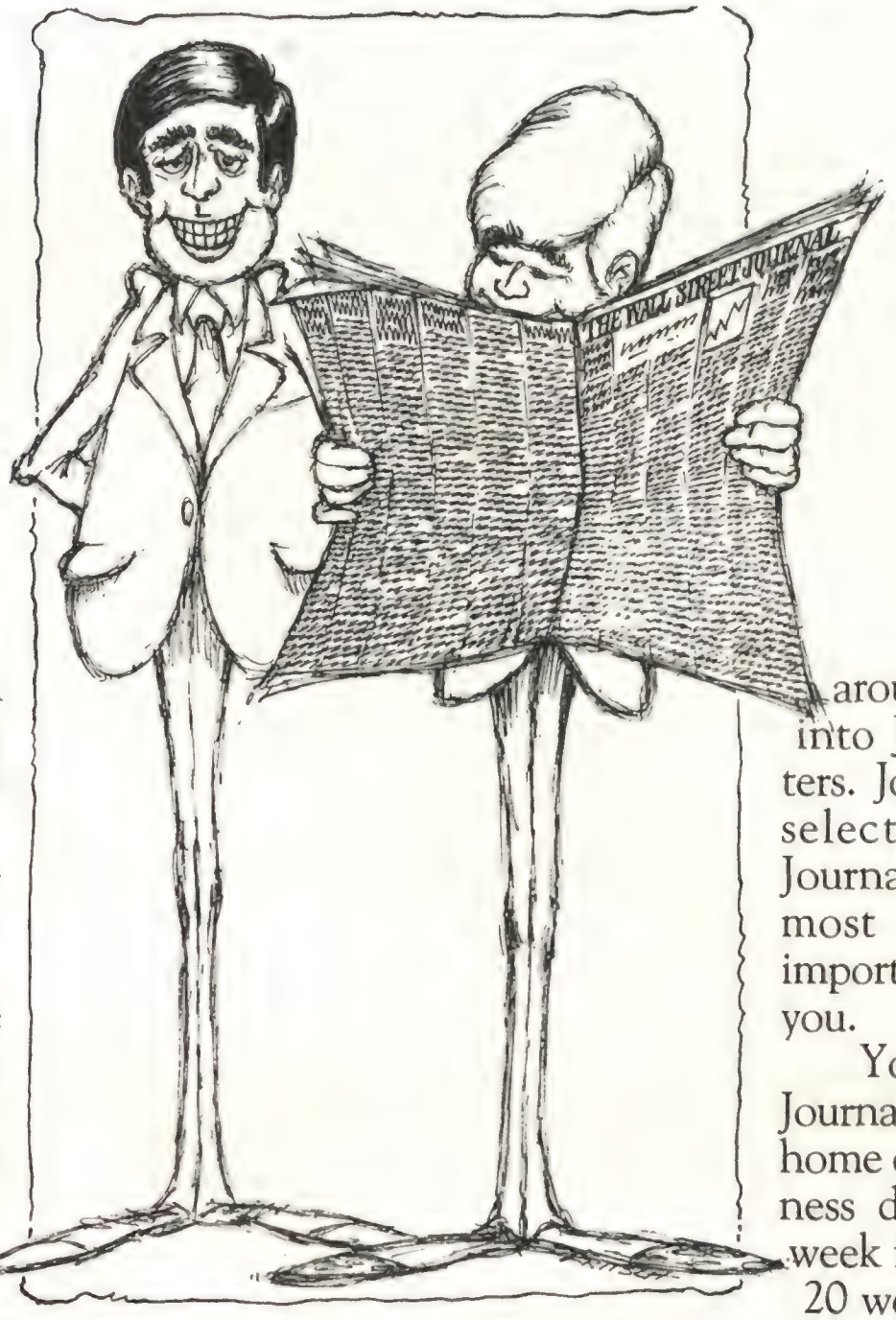
Dear Sir: I hope author Vietmeyer is not suggesting that the United States accept water buffalo as another source of meat. If so, buffalo meat would probably be resisted as horse meat is by the public. But with all the other advantages of the water buffalo, I don't see how any farmer could resist having one or two of those lovable beasts around.
Colleen E. Hogan
Grand Rapids

Dear Sir: Undoubtedly author Noel D. Vietmeyer can distinguish a water buffalo *(Bubalus bubalis)* from a zebu *(Bos indicus).* Therefore some scapegrace caption writer must be to blame for slipping him a ringer—the cart-pulling "buffalo" of the Malagasy Republic are zebus.
Donald Baird
Director, Museum of Natural History
Department of
Geological and Geophysical Sciences
Princeton University
Princeton, New Jersey
Dr. Baird is correct. Ed.

Kudzu

Dear Sir: Your "King Kong Kudzu" article reminds me that the hills, trees,

Which would you rather be:
a yes-man or a know-man?



The easiest thing in the world is to go along with what everybody else thinks is right.

But if you're in business, it may not be the smartest thing.

Because finally, some day, a man or woman in business has to know. Because finally, his or her opinion—if it is to be the right opinion—has to be based on facts. And his or her decision—if it is to be listened to and respected and acted on—has to be made on honest, unbiased, in-depth information.

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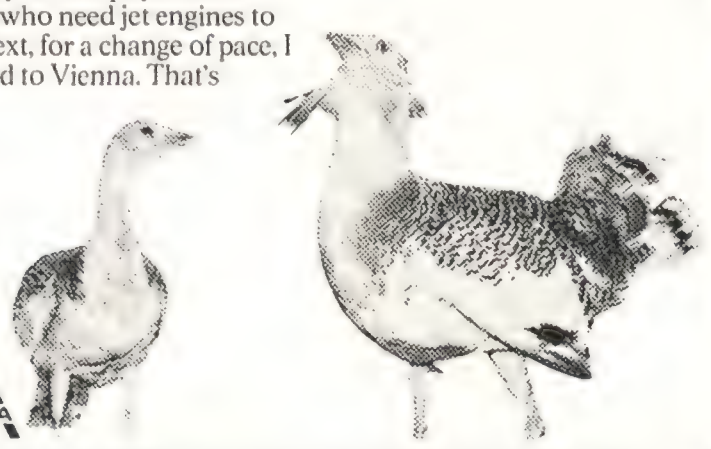
Encounter austria

I was the rarest bird in Burgenland

There I was, the only bird without wings at the Andau Great Bustard Sanctuary, face to face with one of the rarest, shyest creatures in the world. We got along famously. He even agreed to pose for some snapshots. Austria has no less than twelve wildlife preserves and deer parks, four zoological gardens and four magnificent bird sanctuaries. It's paradise for nature lovers. And the birds and beasts go out of their way to take pity on birds like me who need jet engines to soar. Next, for a change of pace, I migrated to Vienna. That's another kind of sanctuary with a special kind of fauna all its own. Believe me, you can fly there too! Find your wings . . .
Encounter Austria to know the heart of Europe.
Write for your free copy of "The Experience Of Nature In Austria."



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shrubs and fences are seen only in winter in their shroud of dead leaves. I understand that kudzu makes a fine hiding place for rattlesnakes and copperheads. I thought everyone must hate kudzu and had no idea anyone could hold a brief for it.
Helen Curtiss
Franklin, North Carolina

Dear Sir: In regard to your kudzu article, we are exploring the feasibility of producing large quantities of methane by the anaerobic digestion of plant matter and organic wastes. Perhaps the prolific kudzu will find beneficial use yet.
Victor H. Edwards
United Gas Pipe Line Company
Houston

Dear Sir: The obvious answer—raise water buffalo in kudzu country.
Jo Oshier
El Toro, California

Fuel Crisis

Dear Sir: Your article on the World War I fuel crisis brought back poignant memories of my childhood. My father was a deputy fuel administrator of the Borough of Richmond, New York, and the only time I ever saw him cry was after a 30-hour struggle to free a coal barge trapped in the ice. At the last moment, it had succumbed to ice pressures on its seams, and it sank.

Hardship, real hardship, has occurred in the past—and could again.
C. C. Van Vechten
Chevy Chase, Maryland

Dear Sir: The team pulling the sleigh over Chicago's snowy streets looks a lot more like two wapiti than two reindeer.
Robert D. Gilmore
Chicago
Mr. Gilmore is correct. Our editor must have had Christmas on his mind. Ed.

Anne Abraham

Dear Sir: The tribute to Labrador explorer Anne Abraham is a story that I will remember the rest of my life. I admire her and, as a teen-ager, wish that I could have had such experiences. Thank you for a wonderful story.
Britton Andrew
Bennettsville, South Carolina

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Around the Mall and beyond

In the month of December, as 1977 approached, there were two special family-oriented evenings at the Smithsonian. On December 7 at 6:30 P.M. one family, the Steinways, gathered around two pianos they were presenting to the Smithsonian's Division of Musical Instruments. The evening was described by one longtime museum staff member as "the nicest event I have ever attended at the Smithsonian." Another guest, Manuel Melendez, public information officer for the Division of Performing Arts, a singer and musician himself, added, "We all felt that we were part of a lovely family evening."

The presentation was a fitting finale to more than a decade of work done by Cynthia Adams Hoover, a curator in the Smithsonian's Division of Musical Instruments. In the 1960s, she began doing research in the archives of the Steinway factory in Astoria on Long Island and in Steinway Hall on 57th Street in Manhattan. She has been calling on the family for the last eight years, and on one such occasion someone said something about the instruments in the "chicken coop" above the factory. She enthusiastically made arrangements to survey the relics in the attic "as soon as conveniently possible" and three years ago she began discussing moving two of those instruments from the chicken coop to the Mall. The earlier instrument is a very handsome rosewood straight-strung grand piano made in 1857; the other, a work of ebony beauty with an elaborate scrollwork music rack and heavy fluted legs, is the 1892 Steinway grand used by Ignace Jan Paderewski during his 1892-93 American concert tour.

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to the Smithsonian. Before, "It made only little sounds," as Cynthia Hoover puts it.

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Three of the four Steinways currently running the business came to the Smithsonian; Henry Z. Steinway, president, made the presentation. He was here with his wife and their son. John H. Steinway, vice president, and Theodore, chief of engineering, and his wife were also in attendance. Mrs. Theodore E. Steinway, "a spry and wonderful woman" and mother of the current officials, came too. Van Cliburn performed the piece he had played for her on the occasion of her 87th birthday—the Liszt transcription of the Schumann song *Widmung (Dedication)*.

Mrs. Theodore E. Steinway and Van Cliburn at Paderewski grand keyboard.

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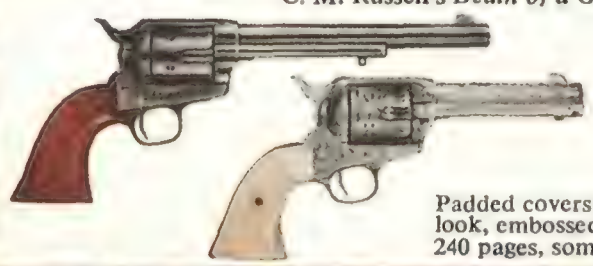

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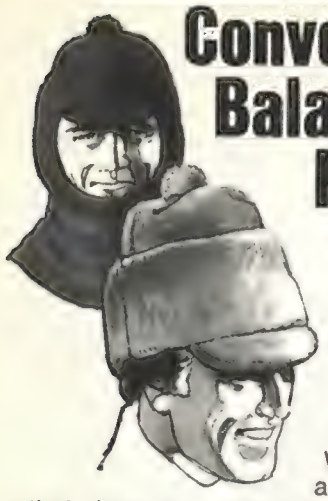

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fitted with glass so that the action can be seen, came directly from the Steinway factory to the Smithsonian in 1882 (although it is not on exhibit). An earlier, 1873 grand stands in the Grand Salon of the Renwick Gallery. Two Steinways in the Arts and Industries "1876" exhibit were encircled by visitors singing carols during the Christmas season. Another, Steinway number 100,000 (they are now up to number 449,000), stands in the hall with the First Ladies' gowns.

Cynthia Hoover says the Paderewski piano plays differently from a modern grand. "It may be due to the fact that Paderewski, as I've discovered in his memoirs, preferred a light touch. The sound is mellower, not as large as that of a modern grand."

She ought to know. She is working on a book about the history of the American piano. A Steinway brother once remarked that she knew more about the history of the business than he did.

On the evening following the Steinways' visit, members of another family came to the Smithsonian—author John Updike, his mother, Mrs. Wesley R. Updike, his 15-year-old daughter, Miranda, and various family friends, including the author's childhood playground supervisor. The occasion was a Frank Nelson Doubleday lecture on "The Written Word." It had a larger audience than any other Doubleday lecture to date. Updike was spellbinding and not a seat was vacant. Coughs, yawns and other signs of intellectual ennui were just as scarce.

The lecture was pure Updike, though the first part was more revealing of the author's private life than most of his writing and it offered a peek into the autobiographical essence of his latest novel, *Marry Me*. He spoke of all the "literate" people with whom *he* has lived—his mother, for whom "reading is not an accessory to life but a main source of its consolations." And his father, who read "much as other Americans eat junk food—omnivorously, compulsively, and with slight nutritional benefits." (He, incidentally, included magazines that flowed into the house "by a kind of postal inertia" as part of his father's diet.) He talked about the family group with which he now lives and the lady heading that household, whom he has found more than once "floating belly up in a random volume of the encyclopedia."

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Updike feels that reading is not only hard work, but unnatural work: "The written word skims in through the eye and by means of the utterly delicate retina hurls shadows like insect legs inward for translation." But he said if readers really understood the art of written language, "an immense space opens up in silence and privacy, a space where, literally, anything is possible. Into an endlessly fecund subuniverse the writer descends, and asks the reader to descend after him, not merely to gain instruction but to experience delight, the delight of mind freed from matter and exultant in the strength it has stolen from matter."

John Updike at Smithsonian's MHT for his Doubleday lecture

Updike continued to delight his readers and admirers at a post-lecture reception. The author himself stayed until 11:30 talking with friends, some old, some new. As long as he keeps inviting us to journey with him through his written words, the print culture is in less danger of becoming obsolete.

Elsewhere, 230 miles away, a member of the Smithsonian's own family, the new Cooper-Hewitt Museum (see November SMITHSONIAN) is closing its opening show. We received a collection of critical press reviews of *Man Transforms* and also of the remarks of museum sightseers. The former couldn't seem to agree whether they liked the designs or not. Probably, as Ada Louise Huxtable of *The New York Times* indicated, they expected more of a Smithsonian collection and less of a mind-blowing.

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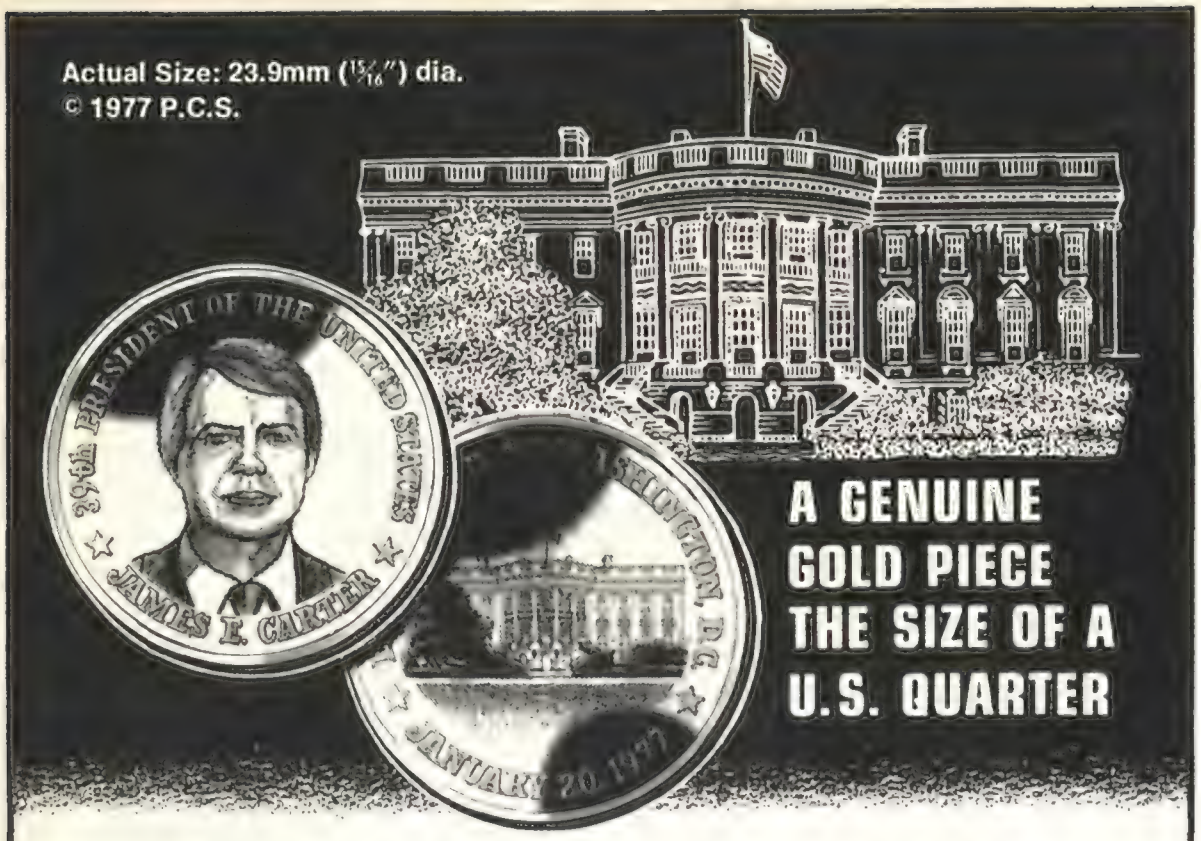
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Most public comments, entered in the visitors' book, were favorable. But the negative criticisms and the suggestions are always more entertaining to read:

"Leave the bread to the bakers and show me the collection."

"Snobbish and arrogant!"

"Transparent, pretentious nonsense."

"Is this a museum or a playpen?"

"There should be a trash can in the garden."

"I couldn't handle the door handle room. It frightened me!"

And a comment on that comment: "Obviously, this was written by someone who needs an unusual degree of security. The handle exhibit was beautiful."

A favorite comment was one which the Cooper-Hewitt people rate as ambivalent and uninterpretable. It was, simply, "Why not?"

Another group of visitors has been commenting on a Smithsonian museum, back on the Mall. The Trailside Country School, a group of 20 or so high school and college-age students under the direction of an educational innovator named Mike Cohen, spend their time traveling all over the country, learning by simply experiencing, by being on the scene. Mike has no use for schoolrooms. A bus is his building, and sleeping bags under the sky are his dormitory. When Trailside kids are studying fossils, for example, that means that they are digging them up in some site, perhaps in Utah.

On their periodic visits to the Museum of Natural History, they are a good deal more critical than other groups:

"A film on wolves at the museum gave information opposite to that found in the exhibit cases. The cases promote the myth of the wolf being mean and destructive."

"Too much emphasis upon naming things rather than conveying ideas or questions or concepts."

"Signs saying 'Specimen removed for study' should tell what the study is about and perhaps its significance."

The Trailside students are on the road about nine months of the year. Their home base is in Killington, Vermont, but that's really no more than a gathering place where the bus is piled with packs and filled with gas. No wonder such dedicated critics add the remark that "Many other kids in the museum came across as a bunch of disinterested rowdies."

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The problem—trapped porpoises bunch up inside a tuna seine; white floats show where net has folded.

Lines of floats show seine pulled out straight, with porpoises on top, as ship tows net into channel.

By Kenneth S. Norris

Tuna sandwiches cost at least 78,000 porpoise lives a year, but there is hope

Once these intelligent, lovable mammals, useless to fishermen, are in the net, it is possible to free them without losing fish

In 1975 some 154,000 porpoises were killed by fishermen seining yellowfin tuna in the Pacific; most of them suffocated in the three-quarter-mile-long nets. No one wants this to happen. Many fishermen need the porpoises as beacons to locate tuna, because the fish typically swim under and behind the porpoises, even during high-speed chases. And the fishermen are keenly aware of the swell of public indignation over the inadvertent porpoise kills that is threatening the existence of the American tuna industry.

Much of the public perceives these animals as sentient, charming creatures, remarkably friendly toward Man, and considered to be the mammals closest to Man in intelligence. Many people are appalled to think that porpoises are being caught, killed and thrown away. One result has been a proliferation of laws and regulations. Quite a few United States fishermen use expensive fine-mesh net in certain parts of their seines because porpoises don't entangle in it as easily as in older, larger-mesh net. Many vessels now carry observers to record each set a fisherman makes, speedboats are required to stand by to pull on the net in case currents should threaten its collapse on porpoises, and the Marine Mammal Protection Act and the Endangered Species Act prohibit the depletion of any marine mammal species, including those being killed by fishermen.

Our fishermen watch in indignation as their rising foreign competition fishes alongside them with none of these restrictions or costs. It's business as usual for the foreigners, many of whom, so the rumor goes, do

Many porpoises remain as net is gathered; the one at lower left center has already drowned.

Dead porpoises are in net between work skiff and boat; two other dead are floating away.

not even bother to use the vital porpoise-saving *back-down* maneuver, a bit of shiphandling that can sluice living porpoises out of the net. Backing down is accomplished after most of the net has been drawn in and stacked on the vessel's stern. On a recent cruise I watched the seiner *Elizabeth C.J.* reverse her powerful engines and move in a broad backward circle, pulling the net into a long, finger-shaped channel behind her. The ship literally pulled the net out from under a tightly packed school of porpoises that had clustered in the middle of the net. Most of the porpoises knew instantly that they were free and raced away, bursting repeatedly from the water in high, arcing leaps.

The uncomplicated nature of foreign fishing has lured many of our fishermen away. Some are now skippers or crew on foreign vessels. Many more, with family ties and other loyalties in the United States, flirt with ways to fish from foreign shores should pressures and costs in the United States prove worse than import restrictions.

I use the generic term porpoise to include dolphins. They are cetaceans, the major taxonomic group that includes whales. Dolphins tend to have an obvious snout or beak. Three major species of porpoise are involved in tuna fishing: the spotter or spotted, the spinner and the whitebelly. All are slim, delicate creatures that live in large, complex schools in the open sea. All are marked with beautiful bold patterns of light and dark (except for one group of spinners that are nearly uniformly gray), and all, I knew, are wonderfully responsive yet shy animals when trained in captivity. Government figures show that the populations of spinners may be depleted, although everyone admits it is dreadfully difficult to count animals in the

Dead spotted porpoises on deck, about to be pushed over the side, symbolize failure in conservation.

A joyful sight to sailors over the centuries, roving dolphins may indicate tuna below.

Underwater photo inside a tuna seine—these porpoises swim

sea. Regulation against catching spinners hangs like a bludgeon over the fishermen, for they often set their nets on mixed schools of spinner and spotter porpoises. The fishery is uncertain whether it can survive without "setting" on spinners. (Only yellowfin tuna, which is favored by consumers, is caught by setting on porpoises.)

This situation is recognized by many conservationists as potentially disastrous and paradoxical. If the fleet goes foreign, no amount of American indignation can be expected to save the porpoises. The very activism of the conservation community will have sealed the fate of the eastern Pacific porpoise populations.

I first became involved in the problem in the early 1960s when a few porpoises came back in the freezing holds of tuna vessels and were turned over to scientists, including me. Later I suggested to a graduate student, William Perrin, that he might study them for his dissertation. He went on to become the world's authority on these tropical porpoises, and is now a central figure in governmental research efforts. Then, while working in Hawaii, I had carried out a long study of wild spinner porpoise behavior. In 1972 I was named to a governmental committee charged with designing a research program to find ways of catching tuna without killing porpoises. We knew that the forthcoming Marine Mammal Protection Act would require substantial progress toward a solution during a two-year grace period. Not long afterward, as a member of the United States Marine Mammal Commission's Committee of Scientific Advisers, I headed the tuna-porpoise subcommittee, and continued to press for a more complete and balanced research program.

Thus it was with some pleasure and a considerable feeling of "put up or shut up" that I accepted leadership of a program to study the behavior of both tuna and porpoises in the fall of 1976, with Dr. Warren Stuntz, an experienced behavioral scientist, as my project manager. The idea was simple enough: perhaps somewhere in the behavior patterns of fish and porpoises we could find the way to release porpoises alive from the seines. The industry contributed funds and invaluable liaison with the fleet through a newly formed entity, the Porpoise Rescue Foundation. The Marine Mammal Commission provided both money and the impetus for the project.

Two groups of government scientists took part, one under James Coe to study net function during tuna sets, and another group under Perrin to assist in the behavior effort. A third group, an acoustic research team under Drs. Frank Aubrey and William Evans (San Diego State University and the Naval Undersea Center, respectively), sought to define the underwater sound found during a porpoise set, including both those of the animals and the vessel and her gear. The National Marine Fisheries Service provided much support, including sea time on their research vessel, *David Starr Jordan*, and arranged for a research allotment of tuna that would allow us to obtain the services of a working seiner. With this allotment the seiner could fish legally, out of season, in return for helping with our work.

What we found will be documented in the next few

Deputy director of the Center for Coastal Marine Studies at the University of California, Santa Cruz, Dr. Norris was chairman of the tuna-porpoise subcommittee, Marine Mammal Commission.

in vertical patterns. Some will let themselves sink and die.

Even though the cork line is submerged here, allowing escape, porpoises swim back toward middle of net.

months. My intent here is to describe some hints from our work and the results of previous gear modifications that promise ways to eliminate a sizable part of the porpoise kill, provided the necessary actions are taken by the governmental, scientific, legal, fishing and conservation communities. I especially want to show reasons for hope at a time when such hope may be crucial to the continued survival of both the tuna fishery and the animals. What I have seen and heard does convince me that for the first time, with application, a major reduction in the kill is possible.

I knew our tuna seiners were sophisticated fishing vessels, but nothing prepared me for my first walk around the *Elizabeth C.J.*, a spanking new member of the fleet. I first saw her as she lay at the wharf in San Diego, all 260 feet of her, a sleek, pale blue ship, with decks trimmed in sea-foam green. A massive net was piled ten feet high on her stern, surmounted with a beamy skiff. Just forward was the working deck, covered with winches, cables and booms. Forward of the deck rose the raking mast, an elevator in its interior. By riding in this little cage, one could reach the crow's nest, a vantage point from which the chase and the setting of the net were often guided.

Directly below, on a broad midships deck, nestled the five speedboats used to round up the porpoises. They are deep V-hull aluminum craft built for durability, for they are always used at top speed, and it is common to see them totally airborne when the seas are rough, leaping from crest to crest in roaring pursuit of a fleeing porpoise and tuna school.

This entire speedboat fleet is launched in minutes by an ingenious system of lines, hoists and hooks. When a porpoise school bearing fish is sighted, the drivers pile into these boats, are dropped into the sea, and race off in a long line ahead of the seiner.

The spacious bridge is modernly equipped, including the latest satellite navigation system which, on a small television screen, continually reads out position to hundredths of a degree of latitude and longitude. Outside on the bridge wings are two pairs of high-powered binoculars. Every daylight hour, starting at dawn, two crewmen scan the horizon for bird flocks, the first hint of porpoises and the fish that swim beneath them. An even more powerful tool is chained down atop the broad deckhouse: a two-seater helicopter, a ship's arm that extends her reach many miles beyond the ship itself. From that platform I was able to look down on fleeing porpoise schools and see "shiners," sun glints from tuna swimming below the mammals. Experienced fishermen can estimate the number of tons of fish involved, and thus make the decision whether to initiate a set.

Below decks the vessel is all power and utility, spotlessly clean. Eighteen holds line one deck to receive 1,700 tons of tuna; refrigeration and recirculation machinery is mounted nearby to cool brine for freezing the fish. When complete, the catch is today worth about a million dollars, dockside. Consider that the ship could be loaded on a good trip in as little as 60 days, and the stakes in this enterprise become obvious—as well as the reason why $5.75 million can be poured into the construction of a single vessel.

Everything in an enterprise such as this depends upon the crew. Our ship, I knew, was a highliner—one of the most successful operations in the fleet—and that was because of the leadership of two most able young men, Manny and Joe Jorge. Both in their late

A tuna clipper closes the circle of net while crewmen drive speedboats in circles to keep the school inside.

30s, they lead their crew easily. Manny, the more somber of the two, runs the ship, while Joe, the affable one, runs the deck operation.

I have worked with fishermen during much of my career, so I knew they would be proud men, and I knew the industry wanted to put its best foot forward with us. After all, I for one was probably suspected of being lined up with their enemies because of my long agitation for a responsible research program, which sometimes caused me to call both the industry and the government to task. They wouldn't want me to see a poor operation, or especially one that killed porpoises in great numbers. That suited me, too, because I wanted to see what the industry could do if it really tried. The government scientists among us were also suspect, because the government has imposed the rules that contain and frustrate the fishermen. We could expect that elsewhere in the fleet things would be less well done.

Tuna seining is a sophisticated effort run by competitive men who can be expected to be quite single-minded about their personal independence at sea, and anything that might affect their chance to fish. They love to fish. Regulations and observers represent a problem, but will be tolerated so long as the boat can fish. The fishermen know their trade and their gear better than anyone else and can be expected to resist ideas from outside that do not take this into account.

What does all this mean in terms of the tuna-porpoise problem? First, I do not expect knowledge of the magnitude of porpoise kill, or the depleted status of porpoise stocks, to be uniformly effective in motivating the fishermen, even though in the long run they depend heavily upon the porpoise for fishing success. Neither do I expect revulsion at killing porpoises to be wholly comprehensible except to a small percentage of fishermen. Each day they kill hundreds of magnificent sleek tuna, and the porpoises die about as the fish do. There is little the fishermen can see that makes the porpoise special. It's when one comes to know them more intimately—through books, films or exhibitions, and especially through personal contact such as my own—that their mass death becomes such a deep-seated issue. I have only to revive memories of a quivering spinner porpoise lying in my arms, filled with fear as I tried to teach it to swim through an oceanarium gate, or of seeing a wild mother spinner disciplining her rambunctious, tuna-sized calf with a little slap of her flukes, to understand the outcry over the killing.

The motivation for reducing porpoise kill naturally lies outside the fleet. In fact, the ethic itself lies outside the fleet. We should design our laws and regulations so they work in the fisherman's world. Regulations, I believe, should be designed as carrots as well as sticks. Current regulations penalize everyone, including the

best boats that try hardest. I think these regulations should be revamped to reward the best boats for their porpoise-saving prowess in the currency they know best—the chance to fish.

So much for the vessel and her crew. What about the animals? What, indeed, do the porpoises and tuna do in a set, and what may be derived that can save porpoise lives? Let me describe a net set from the view of a naturalist.

The school is sighted. On top are perhaps 700 spotters and a few dozen spinners. The helicopter observer estimates that the school harbors upwards of 50 tons of fish, flashing beneath the fleeing porpoises. The word is passed over the loudspeakers that reach every cranny of the *Elizabeth C.J.*, including the heads, the game room and the bunk rooms. The crewmen rush to the speedboats. Fernando straps his belly belt up tight and is lowered over the side. Luis goes. Cowboy goes. And the two Manuels. They race off ahead of the vessel and finally turn the porpoise school to the left. The *C.J.* turns in a broad circle to follow it. Manny and Joe are on the PA system, one from the helicopter and the other from the crow's nest, directing everything. With my uneducated ear I can't tell what is going on, except occasionally.

"Luis, turn Luis." Luis (whose real name is Manuel, but there are too many Manuels for easy identification) is in the lead boat. Luis turns, beating the water white with his whining outboard engine. The porpoises race toward the bending wake of the *C.J.*, leaping in cascading fronts as they go. The *C.J.* heels over as she circles, wrapping them in a spiral of wake.

Trapped in a wall of net

When the wind and the size of the wake circle are right, a signal is given, a man on the *C.J.*'s stern pounds a pelican hook with his sledge and the net skiff slides off the stern, serving as a sea anchor as the net pulls off the ship. George, once a violinist in the Azores, stands erect in his boat as the huge net comes in leaping folds from the *C.J.*'s stern.

Around we go. At half-net I see the porpoise school leaping toward the net circle. Suddenly it slows, still 250 yards from the net, and begins to mill slowly. What has trapped them is the *C.J.*'s deep wake through which they usually will not pass; where that wake is weak, the smaller wakes of the speedboats suffice. I'm quite confident that the porpoises detect these wakes a long distance away by their animal sonar systems.

Once the net circle is complete, it takes a long time to winch in the big cable that purses the bottom of the net and thus closes the trap. Before that time, both tuna and porpoises are confined within a circular wall of net with no bottom. They apparently stay inside only because the net is so deep it hangs down into cold water uncomfortable to them. The porpoises always, based on the 20 sets I saw, take up station in the area of least disturbance, as far away from the big seiner as they can get without crowding themselves up against the net curtain.

Any disturbance that shifts this balance of fear moves the porpoise school. If, for example, a small skiff enters the net, the porpoises take it into account and edge a bit toward the opposite side of the net, striking a new balance. The skiff can easily maneuver the animals anywhere along the far corkline. Any other disturbance has similar effects: a swimmer, objects in the water, an unusual noise source.

Thus, it should be possible at this stage simply to herd the porpoises to a part of the net where they can be freed. When the net is first set, the fish usually seem to be deep, although we occasionally saw some near the porpoises at the surface. It may be possible to keep

Recalled tuna fleet lines the wharf in San Diego. The most sophisticated of U.S. fishing vessels, they may land a million dollars' worth of fish a trip.

the fish and porpoises even farther apart with tuna-attracting methods being developed in Hawaii.

The stakes are high. In 1975 about 20 percent of the kill occurred during this part of the set, and while this was cut in half last year by the use of speedboats to hold the net open, thousands of porpoises are still killed at this stage. Whatever herding method is devised, it must be simple enough to use in fairly rough weather. It must not tangle in the seine. It must not lose tuna. At the moment my thoughts run to a single weighted line that can be stretched across an arc of net containing the porpoises. Using compressed air or some chemical means, the line would produce a curtain of bubbles, like the ship's wake that trapped the porpoises earlier. This curtain, as the line is towed, should move the porpoises, and may well repel tuna. The corkline can then be temporarily and very locally depressed and the porpoises pushed or attracted out. The point is that it is very easy to move porpoises in the net. I believe it will not be very difficult to develop simple and acceptable methods and gear to do it.

But more immediately applicable are some aspects of porpoise behavior in the backdown channel. In combination with new net designs already developed by the National Marine Fisheries Service, these could be used to reduce overall kill by a third or more, and can be applied fairly quickly. All we need is a cadre of trained Jim Coes, to modify the nets of the tuna fleet. Jim Coe is our gear specialist, dedicated to solving both the porpoises' and fishermen's problems. Each time a net set was made, Jim waited until just before backdown began, tossed a one-man rubber raft into the net, jumped in after it, and paddled by hand out into the channel. He went to the marker buoys that showed where the porpoises would soon be sluiced over the top of the net. There he waited as the rafting porpoises moved closer and closer in the current. As they piled against the corkline, he could be seen grabbing them and sliding them over the line, pulling on this dorsal fin, placing that beak over the line so the porpoise would swim out. With his face plate he watched below the surface down into the deep backdown channel. One hand was raised in the air, signaling to the skipper of the *C.J.* to pull harder, or to stop when the fish swam near so the corks would rise and the catch be prevented from escaping. Many times he kept the backdown process going several minutes after any of us on board could see porpoises in the net. Then, in ones and twos, animals would appear at the surface to be helped out. Finally he would wave that the net was clear. Backdown would end, the net would be sacked up and the catch winched aboard.

Coe and Perrin told me that many times the fishermen in speedboats stationed at the end of the backdown channel would look down into the water and see porpoises lying deep in the net, and call them dead. After all, they were sometimes stacked up like cordwood, with bellies shining white. But most of the animals, Perrin and Coe told me, were not dead at all. (Others were swimming so deep they might not be seen.) If backdown ended with them still in the net, these living animals had little chance of survival, because the net is soon "sacked up," a maneuver that crowds porpoises and fish together in a frenzied melee for brailing. Brailing consists of dipping down into the dense mass of tuna, sharks and porpoises with a huge scoop on a cable and winching tons of animals onto the deck.

I decided to see for myself and scheduled a dive in the backdown channel. I found that it's a bit eerie to dive in a tuna seine. One knows that common companions of the fish and porpoise are oceanic sharks, and that they commonly inflict awesome bites on both dying porpoises and fish.

Some U.S. fishermen use nets like these, with fine-mesh sections (at the left) where porpoises can get out without being entangled. The fish usually swim deeper than the porpoises, which makes it possible, with skilled shiphandling, to sluice out the porpoises without losing fish.

At first, as the net was being pursed, I found it hard to get close enough to see the animals very well. They were shadowy shapes merging into the blue. But, as the net was drawn in, it became easy to swim near them and to see their tiered schools reaching downward almost out of sight below. As backdown approached, the animals became more crowded, and they were often all around a swimmer, close enough sometimes to touch. Increasingly, as the set progressed, the spotter porpoises (which are by far the most abundant species in these sets) began to swim more and more in the vertical plane. They dived sharply, throwing their flukes into the air, and descended almost directly downward. None, except some spinners, seemed to move very fast, but they dived down to the limits of vision, 50 or 60 feet below me, then leveled out and came steeply back to the surface. Sometimes, several animals would weave around one another with a ballet dancer's grace as they rose in an arabesque. Then I began to note animals sinking tail first; simply changing their buoyancy and drifting downward, often coming to rest on the sloping mesh walls of the moving net, slightly pressed against it by the water current. As backdown proceeded, more and more animals did this, and clumps of animals could be seen down there, shining pale against the dark blue. I could see the open eyes of some, looking up at me.

Those looks from the trapped porpoises rang a bell in my memory. It was exactly the same behavior I and others had often seen when we pushed a porpoise too far during training. Typically, the animal in question would blow a big bubble under water and sink to the bottom looking up in apparent frustration. No worry, though. Given a minute or two, such an animal would rise to breathe. So it is with porpoises in the backdown channel, just as Jim told us. Give them a minute or two and they scull awkwardly off the net and rise to the surface.

Understanding this behavior can make a big difference in porpoise mortality. While I was on board we made 20 net sets and killed 11 porpoises, of which I felt perhaps eight to ten deaths had resulted from manipulations of the sets by the scientists which the fishermen would not normally make. And we caught 550 tons of tuna. That's a total of 0.02 porpoises killed per ton, if all animals are considered, and about 0.005

per ton if we give the fishermen the benefit of the doubt. The fleet average in 1975 was about one porpoise killed per ton of fish caught, or a kill rate between 50 to 400 times greater than ours.

Now, by no means was all of this fine record due just to Jim's ministrations in the backdown channel. The *Elizabeth C.J.* operates with a carefully modified net designed to remove any fold that might trap a porpoise and to provide a channel for their escape. She also is equipped with fine-mesh net that, more than any other innovation, prevents porpoises from tangling. She operates with a savvy team of fishermen who know precisely how to handle their gear. But, for me, our results show what the fishery can do if properly trained, equipped and motivated. If all our boats modify their nets and learn to handle them with skill, and if a crew member is trained to substitute for Jim, much can be hoped for.

The porpoises that are killed before backdown die in what are called catastrophic sets, where, for one reason or another, the net collapses over groups of porpoises or they entangle in the large mesh. The pace of such catastrophes is usually very slow, taking many minutes to occur. It's then that early release methods could come into play. I think they could also be used to great advantage if the catch of fish or porpoise is very large, and one could expect great crowding in the backdown channel. At any rate, such pre-backdown release methods become a sharply focused research problem. We know what needs to be done.

Such development cannot take place on a working seiner. What is needed is a chance for scientific tinkering, and such operations are utterly antithetical to the fisherman's way of doing things. Thus I view it as a most important step that the fishery itself has voted to provide a vessel dedicated to research, and a program is being designed to use it. A major part will be to train a cadre of Jim Coes. Another will be to learn how to modify nets. Still another will be work on pre-backdown release methods.

But none of this will be especially effective unless the fishermen care. Many of the more farsighted of them are concerned, but others have a "get-it-while-it-lasts" philosophy, driven by debts or ingrained exploitative attitudes. The rules presently lump all fishermen together: the boats that kill few porpoises suffer from quotas imposed because of other boats that kill most of the animals. It is a minority that accounts for a large fraction of the kill. These boats, I believe, must either be prevented from fishing or they must learn to do much better.

Thus I think the rules must provide both rewards for good performance and punishment for bad. One way to do this might be to classify all boats by their porpoise kill per ton of fish caught, and divide the whole fleet into first- and second-class vessels. For example, all boats that kill less than 0.5 porpoises per ton of tuna might be designated first class, while all those over that number would be second class. (The dividing line could be reduced year by year as the fleet gets better at saving porpoise lives.)

Then the total allowable porpoise kill for a given year would be divided into two parts. All vessels might be allowed to fish until two-thirds of the porpoise quota was used, and then only the first-class vessels would be allowed to take the remaining portion of the quota. I'm sure that vessels threatened with such recall would clean up their act. And I'm sure that fishermen who know their gear and animals better than anyone else will come up with dozens of porpoise-saving ideas that none of us scientists ever dreamed of.

Time is of the essence. Last year environmentalists won a court victory that resulted in a quota being set and the fleet ultimately being called back to port despite appeals to the Supreme Court. This year the fleet will be working under quotas for each species and stock of porpoise. If the quotas are as low as many expect, the fleet will be recalled after only a few months. Congress, aware of the plight of both porpoise and fisherman, is expected to take up the matter early in this year, but the completion date for revised legislation is in doubt.

There is hope for both the porpoise and the U.S. tuna fishery. But, while better ways of catching tuna and saving porpoises are being evolved into policy or science, let's not trap ourselves into a corner nobody wants to occupy—the one where the porpoises and the fishery are both lost.

A spinner porpoise glides over the net to freedom, a sight many want to make vastly more frequent.

Lincoln by French with French (from life, in 1925), sculpted by daughter Margaret French Cresson.

By Michael Richman

The long labor of making nation's favorite statue

Lincoln Memorial, looking as if it were always there, was no easy job for its creators, Daniel French and Henry Bacon

In November of 1918, Sculptor Daniel Chester French remarked to a longtime intimate, "I have lived with Lincoln so long that I feel as if he were a personal friend." The feeling was natural although it could not be mutual: back in 1909, French had been appointed sculptor for a statue of Abraham Lincoln for Nebraska's state capitol grounds, where his standing *Lincoln* was unveiled in 1912.

Now the 68-year-old sculptor was nearing the end of another four years with Lincoln, creating the statue that would be the focal point of Architect Henry Bacon's impressive, templelike memorial structure at the west end of the Mall in Washington, D.C.

The completed Memorial, statue in place, was dedicated with tens of thousands in attendance on May 30, 1922. In the last 18 years, when the National Park Service has kept a count, nearly 60 million visitors have climbed the Memorial's marble steps.

Still headless, Lincoln statue is assembled in the Memorial in 1920. Figure before pedestal probably is one of the Piccirilli brothers, who carved all of French's marbles from 1900 on.

Laboring on Lincoln statue

The right hand of Abraham Lincoln, a detail from three-foot working model of the statue for the

Even though French, as a child, may have seen Lincoln alive, how did he create such a superb evocation? How did he know how much to bow the head, how to place the hands? How had he prepared himself for this crowning achievement of his life?

Through an exhibition opening this month at the Smithsonian's National Collection of Fine Arts, we have a unique view of "Daniel Chester French, an American Sculptor." The retrospective show organized by the National Trust for Historic Preservation, with grants from the National Endowment for the Humanities and the National Endowment for the Arts, includes 55 of French's sculptures from small studies in plaster to bigger-than-life bronzes, as well as architectural drawings and photographs.

It opens February 11, following its first showing at the Metropolitan Museum of Art in New York City. After closing in Washington April 17, it will be seen at the Detroit Institute of Arts (June 15-August 28) and at the Fogg Art Museum (September 30-November 30) in Cambridge, Massachusetts.

The seated *Lincoln* is the nation's favorite marble, and although it remains undisturbed in the Memorial, its weight is felt throughout this exhibition.

How there came to be a seated *Lincoln* executed by French and exhibited so appropriately in a complementary setting is a tale of artistic interaction that would be all but impossible in contemporary America.

French, as a public sculptor, could not work in some remote garret; in today's terms, he worked in a goldfish bowl. Throughout the many stages of translating an intangible concept into tangible marble, he worked in concert with patrons, critics and studio assistants. His every move was calculated, for he had to be a diplomat, contractor, publicist and businessman as well as a consummate artist.

Youngest of four children in a well-to-do New England family, he was born in 1850, early enough to have heard and read reports of battles and casualties during the Civil War, early enough to bring his own living perspective to the Gettysburg Address.

Much of his youth was spent in Concord, Massachusetts, where he was introduced to sculpture by May Alcott, sister of the popular novelist. With little formal training and no academic study, he embarked on a career that would bring him fame and fortune, both richly earned. By the age of 40, he had produced just seven monuments. However, the popularity of the *Minute Man* in Concord and the *John Harvard* at Harvard University carried the late-flowering Daniel

Michael Richman, an art historian, organized the Daniel French exhibition and is editing the Daniel Chester French papers for the National Trust.

Memorial. As modeling references, painstaking French even made several castings of his own hands.

French to the forefront of the American art world.

During his next 40 years—he was active until his death at 81 in 1931—his productivity exploded. More than 100 of his sculptures decorate public buildings and parks in more than 35 cities from San Francisco to Boston, from St. Paul to Atlanta.

Of necessity, French was a disciplined man. The preparation of iron armatures, building up the clay models, roughing out surfaces and casting the finished statue in plaster were chores handled by apprentices and assistants. French would create the first small clay sketch alone and then perform only the final modeling on the enlargements. No clay was ever cast in plaster without the sculptor's personal attention to the modeling. He often was at work on three commissions, in various stages of completion, at the same time.

The story of the Lincoln statue begins in 1901 with recommendations of four distinguished Americans whom Congress had invited to plan for the revitalization of the nation's capital.

The four were architects Daniel H. Burnham and Charles F. McKim, landscape architect Frederick Law Olmsted jr., and sculptor Augustus Saint-Gaudens. They urged that the city's central corridor, the Mall, be extended beyond the Washington Monument to the Potomac River. At this western terminus, on reclaimed tidal flats, the long-contemplated memorial to the 16th President should be built.

Congress was reluctant to endorse the plan. Alternatives were proposed. One senator advocated that a 200-foot-wide, 72-mile-long highway be built between Washington, D.C., and Gettysburg, Pennsylvania. Joseph Cannon, Speaker of the House of Representatives, staunchly exclaimed: "So long as I live, I'll never let a memorial to Abraham Lincoln be erected in that goddam swamp." But supporters of the Potomac River site were resolute.

Obvious choice: the country's foremost sculptor

The Lincoln Memorial Commission, established in 1911, selected architect Henry Bacon to prepare plans. Possibly in deference to "Uncle Joe" Cannon, a second architect was asked to design a memorial at two other Washington locations.

Bacon considered many design alternatives. His first concept called for a 36-columned Greek-inspired temple with a central atrium and flanking sanctuaries that could contain "a statue of heroic size expressing [Lincoln's] humane personality [and] memorials of his two great speeches, one of the Gettysburg speech, the other of the second inaugural address, each with attendant sculpture and painting telling in allegory of his splendid qualities evident in those speeches."

Today, the use of sculpture and painting as a symbolic accoutrement for architecture seems inappropriate, but to the turn-of-the-century artist, trained in the tradition of the Ecole des Beaux-Arts in Paris, the union of the arts was a creative ideal.

The selection of the sculptor was the responsibility of the Commission, with the architect having a voice in the decision. In previous years, the choice of sculptor for many of the Civil War memorials erected in Washington with government funds had been chaotic. Open competition—democratic in theory—that any sculptor could enter often ended with the selection of a hometown favorite or a mediocre artist. The Lincoln Memorial Commission never considered a sculptural competition; the work should be entrusted to the country's foremost sculptor. The choice seemed obvious: Bacon's good friend, 65-year-old French.

His appointment at the end of 1914 apparently met

with no opposition. French's course of action was set: he would resign his chairmanship of the nation's Fine Arts Commission to execute the statue that one contemporary declared—with no bow toward the 28-year-old Statue of Liberty—probably would be seen by more people than any other sculpture in the world.

Work on the memorial building was well under way when French first began to make a statue, not by executing preliminary drawings but rather by modeling at small scale in clay.

He had, after all, steeped himself earlier in Lincoln research for the Nebraska statue, reading biographies, studying photographs, principally from the collection of Frederick Meserve, even purchasing the Lincoln life mask and casts of Lincoln's hands.

Now, again, French faced the crucial problem of the historical sculptor. A biographer creates a multifaceted portrait in words, but the sculptor must focus on a single theme, creating a likeness that embodies and communicates his subject's essential qualities.

"At present I feel very much encouraged, but I am suspicious of my first enthusiasms," French confided to Bacon. "When I get anything that is worthwhile, I shall, of course, expect you to come up [to Chesterwood, the sculptor's Massachusetts home] and see what I have to offer."

In the small model, or maquette, French began to grasp the basic design, being concerned initially with the form and shape of the composition. With Bacon's satisfaction warmly given, French submitted the first model to federal officials in Washington. Approval came quickly from the Lincoln Memorial and Fine Arts Commissions. Attention next was turned to the preparation of a contract. To expedite matters, French worked directly with the Commission's secretary, William Harts, to determine the precise language. On two points French was uncertain: the final size of the statue and the material to be used. Words of qualification were inserted into the contract, which was signed on December 22, 1915. The statue would be not less than ten feet tall and it would be made either of the best statuary bronze or marble.

The next step was the production of a three-foot intermediate statue or working model, completed by March 1916. In this first enlargement, several changes appear. The position of the feet and the disposition of the hands have been altered. The head is tilted forward. Treatment of the chair has been changed by introducing a more imposing design with fasces, and an American flag.

Memorial cornerstone was laid on Lincoln's birthday, 1915. Joseph Blackburn, former Kentucky Senator, is under pulley. Architect Bacon stands at his left, Col. William Harts, Commission secretary, far right.

Hard decision: how large a Lincoln?

Fortunately, the Commission's inspection of this working model did not prevent French and Bacon from making later changes. In the summer of 1916, French began work on a seven-foot model, in which anatomical accuracy, exact physical appearance, and sartorial correctness were achieved. The preparation of this large clay model was time-consuming, with much of the preliminary work performed by studio assistants. Once that was completed, French undertook the critically important modeling in September, finishing his labors—as inscribed on the left side of the base—on October 31, 1916.

Apparently by this time French and Bacon had agreed that the statue would be about 12 feet high and cast in bronze. Doubts persisted, however, and so a plan to eliminate these lingering reservations was devised. As Bacon later reported: ". . . Mr. French set up in the Memorial a plaster model of the statue ten feet high, and we found it was too small; and after experimenting with enlarged photos of the statue of varying

Project's partners, sculptor French at left and Bacon, the architect, at statue before May 1922 dedication.

sizes, it was determined that the statue should be nineteen feet high, and that it would be best to have it cut in white marble. . . . The unusually large scale of the interior of the Lincoln Memorial becoming apparent as the building approaches completion shows that a larger statue is necessary. . . ."

Only this pragmatic demonstration convinced the sculptor and architect of the statue's required size. With the scale decided, the choice of material became the final artistic concern. In his first statement about the memorial, in 1911, Bacon had conceived of the statue in marble. But with French's involvement in the project, bronze had been considered. (In estimating the costs of making the statue French assumed that a ten-foot seated statue in bronze placed in a marble chair would cost $18,000.) A 19-foot bronze statue easily could have been cast, but its effect in the interior space apparently generated little enthusiasm in the architect and sculptor. This left French and Bacon with a troublesome problem, a cost overrun. French originally agreed in his contract to make the statue for $45,000, but, he reported, the Georgia marble and the carvers' fee could cost an additional $46,000.

Members of the Memorial Commission, without undue deliberation, agreed with the creators, and on December 31, 1917, signed a supplemental contract with French for $43,400.

By then the superstructure of the Memorial had been completed, but it would be November 1918, the month of French's "I have lived with Lincoln so long" statement, before carving could be started.

The carving in New York City was entrusted to the Italian-born Piccirilli brothers by French, who respected their skills in fashioning stone. The brothers worked simultaneously on 28 blocks of marble, "pointing up" the seven-foot plaster model with the aid of an enlarging machine.

It was now 1919, the ninth year of involvement with the project for Bacon and the fifth for French as an active contributor. The sculptor needled his friend: "I hear you have made half a million out of the Lincoln Memorial!!! So glad I know you."

Bacon promptly replied: "Where in the world did you hear that I had made half a million out of the Lincoln Memorial? Of all the works I have ever engaged in, this Memorial has been the most unprofitable financially. . . . The Government does not allow my travelling expenses to Washington, which have been on an average, I should say, once every ten days for the eight years, the cost of the drawings and models has been abnormally high, furthermore the red tape and officiousness of some of the bureaucrats in Washington has been incalculable in cost to my temper. . . . The total commission I will receive will be less than $150,000, the larger portion of which has been spent in drawings, models and supervision. Selah!"

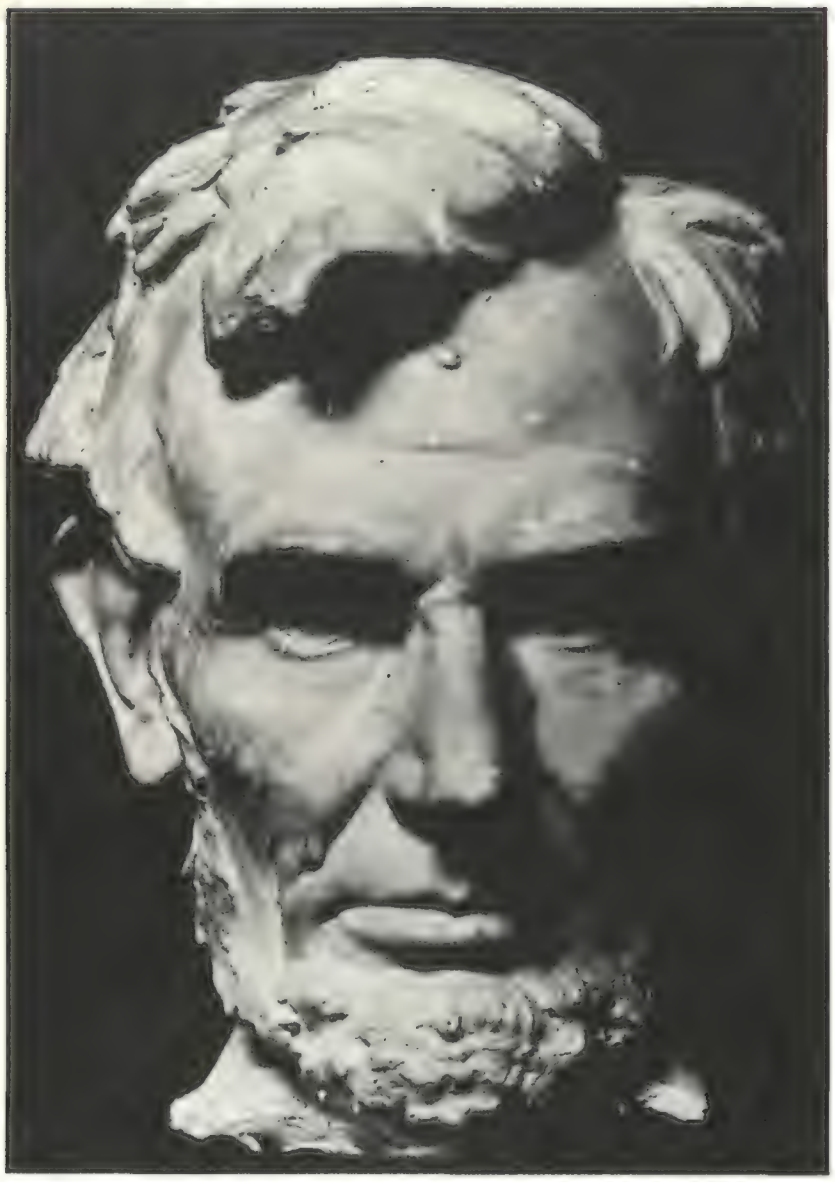
At last, the final stages of carving

On November 19, 1919, the Piccirilli brothers completed their carving. The assembling of the marble blocks was well under way in late December. In February the statue was nearly finished, as the sculptor reported to his friend Newton MacKintosh: "I was very much relieved to see that it was not too large for its surroundings. I got into rather a panic about this for it didn't seem that a statue that large could fit into any place without being too colossal."

As was his practice, French was involved in the last stages of carving of the *Lincoln*: "I worked personally on the marble, both while it was at the marble shops and after it was set in place in the Memorial." On May 24, 1920, French wrote, "The Lincoln statue, with its pedestal, is an accomplished fact. . . . It is now as nearly perfect technically as I can make it."

While French had tested the large plaster head of Lincoln in the Memorial in 1917, it was not until the Memorial was finished, the reflecting pool filled with water, the approaches completed and the entrance stairs cleared that he fully realized the extent of the adverse natural lighting.

French wrote to the secretary of the Commission: "I have been talking with Mr. Bacon about the possibility of lighting the Lincoln statue artificially by some arrangements of electric lights. While the present



Before (top) and after studies of Lincoln's face show how artificial lighting improves its appearance.

lighting of the statue is tolerably good at some times of the day, it at no time brings out the expression of the face as it ought to. The ideal lighting for most sculpture is from above at an angle of forty-five degrees, more or less. I had hoped that the light from the sky-light would be sufficient to overcome to some degree the light that comes in at the opening in front, but it fails to do this even in the afternoon when no sunlight enters the building."

An experiment with electric lights was made in January 1922. The results were disappointing. To demonstrate how severely the lighting affected the statue's appearance, French had a composite photograph (left) made, explaining that the two versions of the face showed "one in the light that it receives under the worst conditions in the Memorial, the other as I feel it ought to be lighted."

By the time the Memorial was dedicated on May 30, 1922, the *Abraham Lincoln* was not yet satisfactorily

Skaters skim the reflecting pool at time of a 1963 service for another assassinated President, John F. Kennedy.

displayed. Two years after the dedication, French was still concerned about properly lighting his statue. He wrote to Charles Moore, then head of the Fine Arts Commission: "What would you think of the idea of lighting the interior of the Lincoln Memorial at night? . . . It seems to me that it would be a popular move. The Memorial would have an added interest as seen from a distance, and I think that it would be visited by a great many people in the evening."

Not until February 1925 did French receive assurances that he might see his statue correctly lighted, when a plan was prepared by the General Electric Company. Congress did not provide money for the lighting system until September 1926. French reported to a friend, George S. Keyes, the following March, "I had not had much faith that artificial lighting would solve the problem, but it seems to have done so very effectively, and I am very happy."

French's seated *Abraham Lincoln* was for him the paramount achievement of his long and productive career, and he heard it praised for its stability, repose and natural majesty. There is in this *Lincoln*, as there is in perhaps no other portrayal of this revered President, a feeling for the intense pressure the man felt and the humanity that he exhibited in his Presidency. To enter the Memorial is to confront the man, large in size but not a demigod aloofly enthroned. French could well have deified his subject, but he did not. He avoided the pomp and circumstance inseparable from Olympian Zeus. The statue is of a compassionate man, deeply committed to preserving the Union.

French himself wrote, "What I wanted to convey was the mental and physical strength of the great war President and his confidence in his ability to carry the thing through to a successful finish. If any of this 'gets over,' I think it is probably as much due to the whole pose of the figure and particularly to the action of the hands as to the expression of the face."

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Dear Mr. President:

Respectfully,

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Red veil configuration of this intensity is very rare, but sometimes seen in mid-latitudes. Observers have confused it with fires of human origin. Spectacular displays correlate closely with sunspot cycles and are often the cause of serious worldwide disruptions in communications systems.

By Thomas A. Potemra

Aurora borealis: the greatest light show on Earth

Polar phenomena may shed light on changes in climate, the ozone shield and perhaps even biological and evolutionary processes

Streams of electrons and protons crash continuously into our atmosphere, stripping electrons off the nitrogen molecules and oxygen atoms and providing energy for the spectacular sky show we in the Northern Hemisphere know as the aurora borealis or northern lights. This phenomenon has intrigued philosophers since ancient times. Today, scientists are trying to find out what happens when up to a trillion watts of power are injected into the upper atmosphere, producing heat, x rays, ionized particles and, when viewed from space, more light than all the cities of North America. The basic forces at work are still not clear, and we don't know what effects all this energy has on weather, climate, the ozone layer and biological processes. But knowledge is increasing by the year.

Descriptions of the aurora appear in the mythology of the Eskimos and the Scandinavians. Northern Germanic tribes considered auroras to be the shields of the Valkyrie warrior-women. The Australian Aborigines thought the aurora australis (southern lights) to be the gods' campfires; and the natives of Ceylon putatively revered it as a message from Buddha.

Mentions of the aurora borealis are not uncommon in Greek and Roman writings; major displays were recorded and analyzed by Aristotle, Pliny the Elder, Seneca and others.

In the *Pennsylvania Gazette* of 1737 Benjamin Franklin wrote of an aurora so red and vivid "that People in the Southern Parts of the Town imagin'd

Sky over University of Alaska at Fairbanks is almost completely filled with light produced by intense excitation and ionization of atoms about 60 miles up.

there was some House on Fire near the North End: and some ran to assist in extinguishing it." Franklin believed the aurora was caused by the transport of warm, humid electrified air from the lower latitudes to the polar regions, where it condensed as snow and discharged its electricity through the upper atmosphere (p. 68). In 1716 Edmund Halley, more famous for his study of comets, theorized that the aurora was dependent in some way on the Earth's magnetic field lines. In the mid 1800s, Carl Friedrich Gauss suggested that "electricity in motion" was a probable cause of the lights.

When long-distance telegraphy became practical, it was discovered, as predicted by Michael Faraday, that variations in the magnetic field produced abnormal currents in the lines. This phenomenon was so well known in Scandinavia that Norwegian telegraphic offices were able to give some warning to the early 20th-century physicist Carl Störmer to prepare for a favorable evening's observation of the aurora. Even today, disruptions of major power distribution networks and telephone circuits in the United States and Canada can at times be traced to extremely intense activity in the Earth's magnetic field that are called geomagnetic storms.

The dramatic light displays of the aurora are caused by high-energy electrons and protons which bombard the upper air with energies of up to hundreds of thousands of electron volts. Atmospheric molecules are blasted apart and ionized, thereby absorbing a small fraction of the energy dumped by incoming particles. When the atoms and molecules of the atmosphere return to a stable state they release energy, sometimes in the form of visible light. By sorting out the wavelengths of the emitted light with a spectrometer, scientists have been able to identify the atmospheric gases which produced them. The excitation of oxygen atoms, for example, always produces emissions with wavelengths of 5,577 angströms, which appear as greenish-white light, and 6,300 angströms, which appear red. The angström—one hundred millionth of a centimeter—is named for the Swedish scientist who conducted the first measurements of auroral spectra during the middle of the 19th century.

The energetic particles which produce the aurora penetrate the atmosphere to a depth where gases are sufficiently dense to absorb their energy. High-energy particles are able to penetrate deeper into the atmosphere, whereas particles with lower energies are stopped at high altitudes. Most visible auroral forms are found about 60 miles, or 100 kilometers, above the Earth's surface.

The particles are guided to the polar regions by the Earth's magnetic field lines. The geomagnetic field can be thought of as being produced by a powerful bar magnet near the Earth's center, with the axis of the magnet tilted slightly away from the Earth's rotational axis (p. 69). The poles of this magnet are located near Thule, Greenland, and Vostok, Antarctica, a Soviet research station. The field lines are almost vertical to the Earth in the polar regions, so the light displays produced by incoming particles appear as moving curtains in the wind. These curtains are relatively thin but can extend for thousands of miles in the east-west direction. The auroral curtains can develop folds and raylike structures and dance across the sky, creating evanescent but unforgettable images.

The aurora can also appear as a thin red veil over a huge region of the sky. This is the form sometimes observed at mid-latitudes, and may have been the type seen by Seneca and Franklin. The lights of the aurora generally are not found over an entire polar cap, but

Rays of "curtain" aurora reveal alignment of invisible magnetic field lines extending to Earth.

are concentrated in relatively narrow doughnut-shaped regions which encircle the north and south geomagnetic poles. The regions tend to be oval rather than neatly circular, because the Earth's magnetic field is severely distorted by that continuous flow of ionized gas or plasma from the sun called the "solar wind." The distorted geomagnetic field with its contents, including the Van Allen radiation belts, is the "magnetosphere." Charged particles are stored in the magnetosphere and eventually energized to produce a variety of effects, including the aurora.

The auroral ovals vary in thickness and diameter with changes in the geomagnetic field. A typical oval might be 250 miles, or 400 kilometers, wide with a length of about 2,400 miles, or 4,000 kilometers. The total area could amount to a million square miles—approximately double the size of Alaska. A tremendous amount of energy is poured into an area equal to less than one percent of the Earth's surface.

The north auroral oval is displaced toward the North American continent, because of the location of the geomagnetic pole, and passes over Alaska, northern Canada, Greenland and Scandinavia. During intense magnetic storms auroral phenomena shift to the south, and may reach as far as, say, the southern United States, although this is highly unusual.

Satellite photographs of auroras from above show them to be complex and variable; they can fill up the entire oval, extending completely around the Earth in the auroral zone. Intense sunlight washes out any attempt to observe them from the Earth during daytime hours, but satellite data prove that they do persist throughout the day.

The northern lights have been studied more extensively than the southern, because there are more observers in the Northern Hemisphere. But satellite experiments during the last decade indicate that much of the southern aurora is like its northern counterpart. This was expected because a geomagnetic field line threading through a given location in the south polar area extends well into space and eventually touches the Earth's surface again in the north polar zone. The lines trace out patterns similar to those produced by iron filings on a cardboard sheet over a simple bar magnet. The two "feet" of a given magnetic field line in the north and south hemispheres are said to be "magnetically conjugate." For example, points near the Great Whale River in Canada and Byrd, Antarctica, share the same magnetic field line. Because the energetic particles responsible for the aurora are guided by magnetic field lines, similar auroral activity is expected over the conjugate locations. This also suggests that the source of auroral particles must lie somewhere along the magnetic field line in outer space. It is speculated that this source may be equidistant from the conjugate points of the magnetic field line on the Earth's surface, and thus far above the equator.

Magnetic disturbances are observed locally near auroral displays, suggesting that large electric currents are associated with auroras. These disturbances were first studied around the turn of the century by the Norwegian scientist Kristian Birkeland, who thought electrical currents flowed into auroral formations from out in space. One of the first theories to explain these currents in terms of solar-terrestrial interaction was published in 1939 by the Nobel laureate Hannes Alfvén, the father of modern plasma physics. But it was only in the last decade that satellite observations confirmed that such currents indeed enter and leave

Emissions of molecular oxygen and nitrogen produce lavender chevron, a classic spectral signature.

Diaphanous filigree of green and white exemplifies the extreme delicacy of this common auroral pattern.

along magnetic field lines. Their strength, direction and location were also measured.

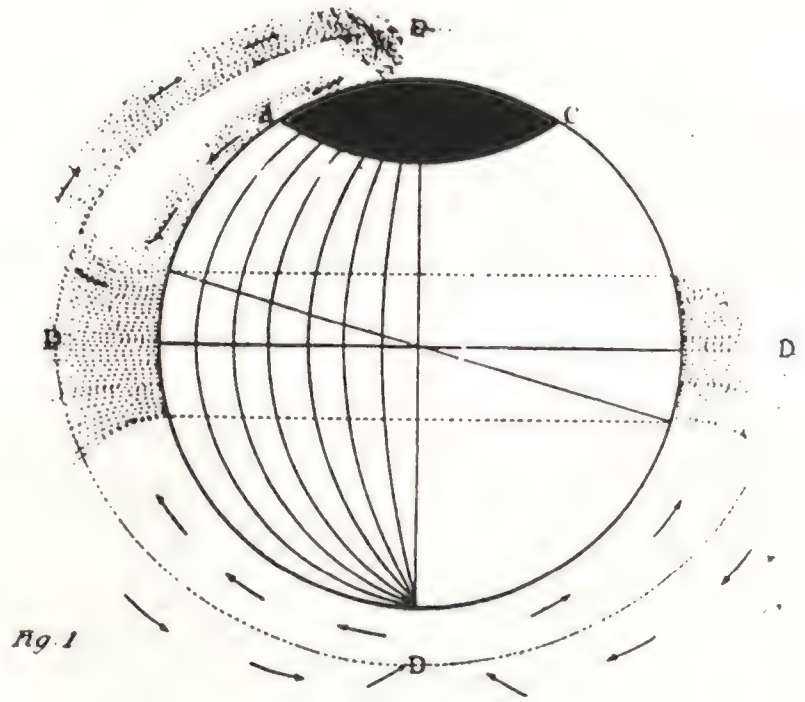
Field-aligned currents, sometimes called "Birkeland currents," cause small perturbations in the sensitive magnetometers used to orient satellites with respect to the Earth's magnetic field. These currents flow in and out of the boreal and austral regions continuously. Their strength varies according to "space weather" conditions, but usually intensifies as the Earth's magnetic field is disturbed, primarily by solar activity. Field-aligned currents are measured at a few millionths of an ampere per square meter. When summed up over the auroral region as a whole, the total current ranges between one million and ten million amperes.

The source of field-aligned currents is believed to be the vast reservoir of electrons and protons called the plasma sheet, reaching from 25,000 miles, or 40,000 kilometers, above the equator to beyond the orbit of the moon. Magnetic field lines from the north and south thread through the plasma sheet and can conduct currents to the auroral regions. The precise mechanism which drives currents from the plasma reservoir into the auroral zones is not clearly understood, but appears to be related to intricate plasma processes which depend upon solar activity and varying conditions in the Earth's magnetosphere.

In any event, currents are driven from the plasma sheet down to the north and south auroral regions, where they flow horizontally at altitudes of about 60 miles, or 100 kilometers, and finally find their way along other field lines back to the plasma sheet. This two-current system forms two cone-shaped regions terminating at the auroras (p. 69). During the early dawn and morning hours, currents flow into the atmosphere on the polar side of the auroral oval, and away from the atmosphere on the equatorial. During the afternoon and evening hours, the directions are reversed; currents flow into the atmosphere on the equatorial side and away on the polar. This large-scale circulation pattern (the shell around the Earth, p. 69) remains fixed in space with respect to the Sun, while the Earth rotates within it. The current flow reverses direction near noon and midnight, and these reversals produce a number of complicated effects.

The field-aligned currents can dissipate a trillion watts of power in the lower atmosphere, depending upon geomagnetic and solar conditions, an amount of energy exceeding the total electrical generating capacity of the United States.

Although currents are always flowing into and out of the auroral regions, the aurora is seen only, as we have said, when the particles that make up the currents have enough energy to excite and ionize the atmospheric gases, so emissions of visible light represent only a fraction of the total energy at hand. Some of it heats the atmosphere and thus sets off infrasonic waves that have been detected as far away as Washington, D.C. The frequency of such acoustic waves is imperceptible to the human ear, but, strangely enough, claims of "auroral sounds" date back to Arctic explorers in the last century.



The Arrows represent the general Currents of the Air.
A.B.C. *the great Cake of Ice & Snow in the Polar Regions.*
D.D.D.D. *the Medium Height of the Atmosphere.*
The Representation is made only for one Quarter and one Meridian of the Globe: but is to be understood the same for all the rest.

Franklin, always a man of the Enlightenment, devised theory that moist, electrified air from tropics circulated to polar regions, condensed into snow and discharged there, manifesting itself in auroras.

Chemical changes in the atmosphere are also provoked by the influx of energetic particles. In particular, the density of nitric oxide increases. The gas catalytically destroys ozone, thus diminishing the shield that protects us from cancer-producing ultraviolet rays (SMITHSONIAN, June 1975). The ozone layer also plays an important role in regulating the total amount of heat absorbed from the sun, which ultimately affects the climate. Correlations between sunspots and changes in climate (as well as stock market prices, vintage years of wine and birth rates!) have been claimed for decades. Whether there is any genuine connection between solar or auroral displays and the Earth's weather, however, is still unsubstantiated.

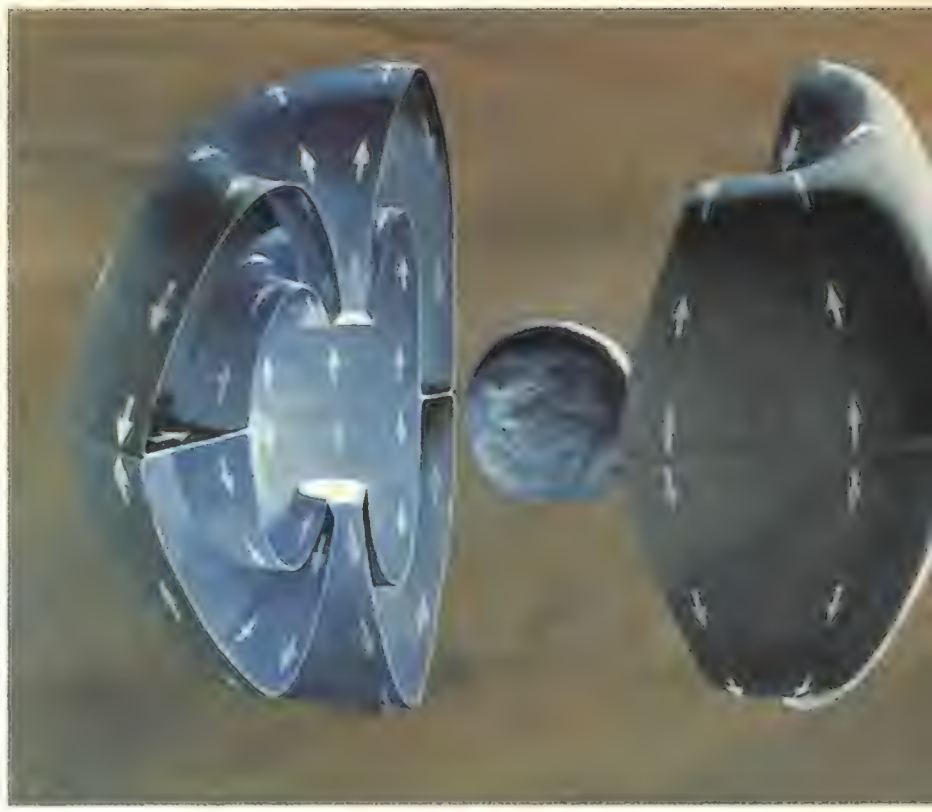
Major fluctuations in atmospheric ionization occur almost every day in polar areas, rendering radio communication difficult, if not impossible. The quality of radio reception was often used by scientists in the 1920s to predict auroral activity. One other effect is the propagation of x rays that can penetrate down to the top of the stratosphere.

The auroral ovals represent the focal points of a fascinating type of solar-terrestrial interaction. Thermal effects, chemical changes, ionization, x rays—these matters have been studied for years, but puzzles abound. How do solar particles enter the Earth's magnetosphere and become stored in the plasma sheet? How are particles in the sheet energized and directed toward the Earth to form field-aligned currents and produce light?

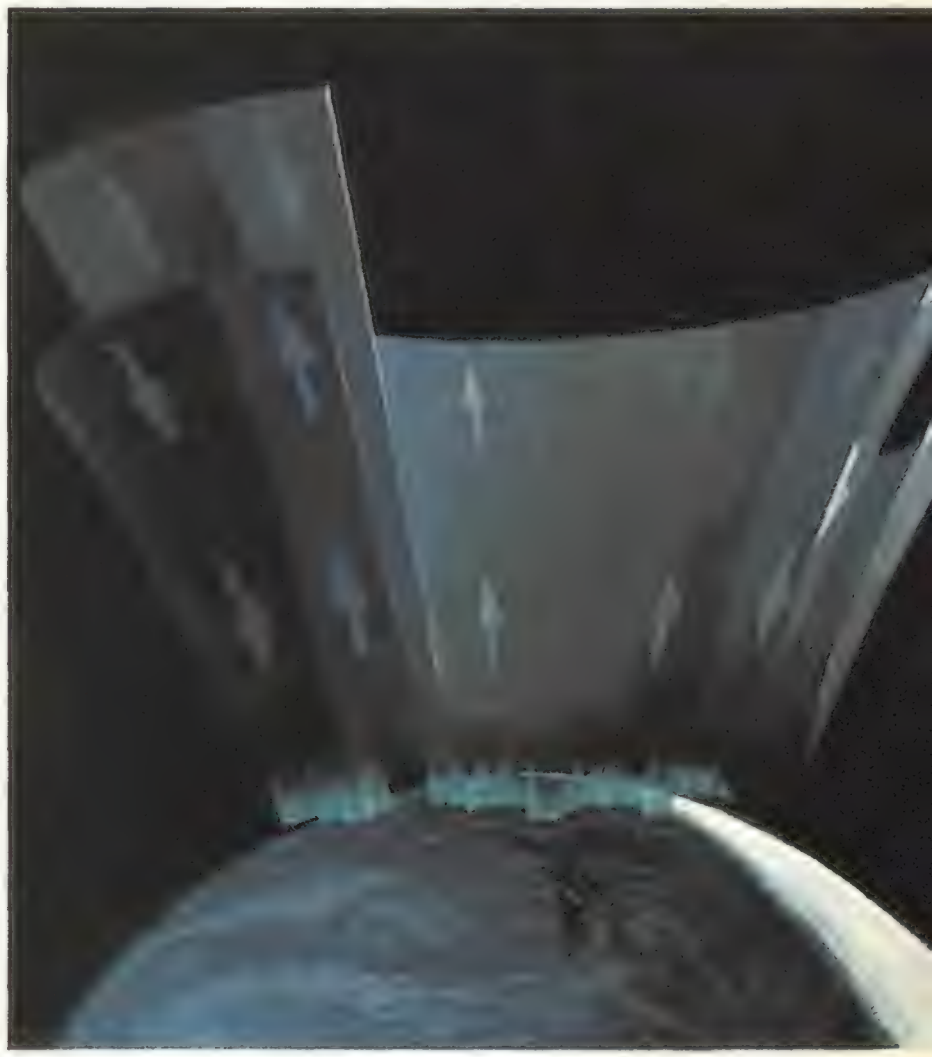
Most of the auroral energy is absorbed high in the atmosphere and therefore probably would not affect life on the surface directly. But is it possible that chemical changes in the upper atmosphere somehow modify other wavelengths of solar energy to produce major changes in the biosphere? Do low-frequency sound or radio waves associated with the aurora have an effect on biological processes? Are electric currents of such magnitude capable of inducing subtle physiological modifications in plant and animal tissues and even behavioral changes that we cannot yet quantify, let alone appreciate? We cannot really say yet.

Superstitious attitudes toward the northern lights have abated since the days of Seneca and Franklin. But, as in many other realms of research, perhaps more questions are raised by inquiry than answered, questions that span all of science. The vast amount of energy in the magnetosphere may be impossible to tap to alleviate the energy crisis, but studying the aurora can help us understand the delicate, complex and protean environment of this beleaguered planet.

Dr. Potemra, a space scientist who is engaged in auroral research at the Johns Hopkins Applied Physics Laboratory, has written many articles and monographs.



In afternoon and evening (left), field-aligned currents flow along inner magnetic field lines to north, south ovals and back on outer layer. Current flow is reversed on morning side (right). The Earth rotates within fixed auroral ovals.



Detail of drawing above shows field-aligned current flow on night side of planet. Cones terminate at auroral ovals. Current is permanent, but striking visual phenomena occur only when incoming particles are energetic enough to produce gas discharge.

Composite satellite photos taken April 14, 1974, show oval shape of aurora circling north geomagnetic pole. City lights of North America are bright but cannot match trillion watt output of nature's own.

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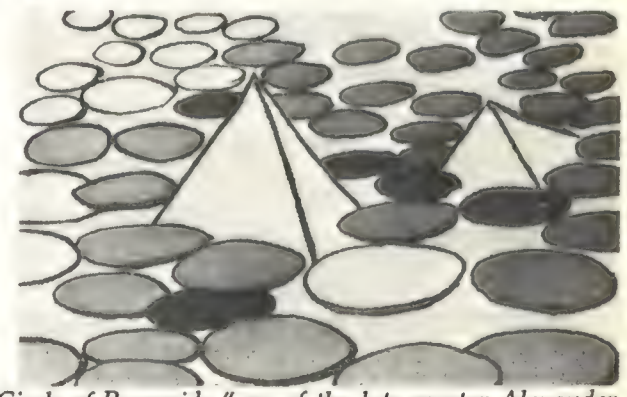

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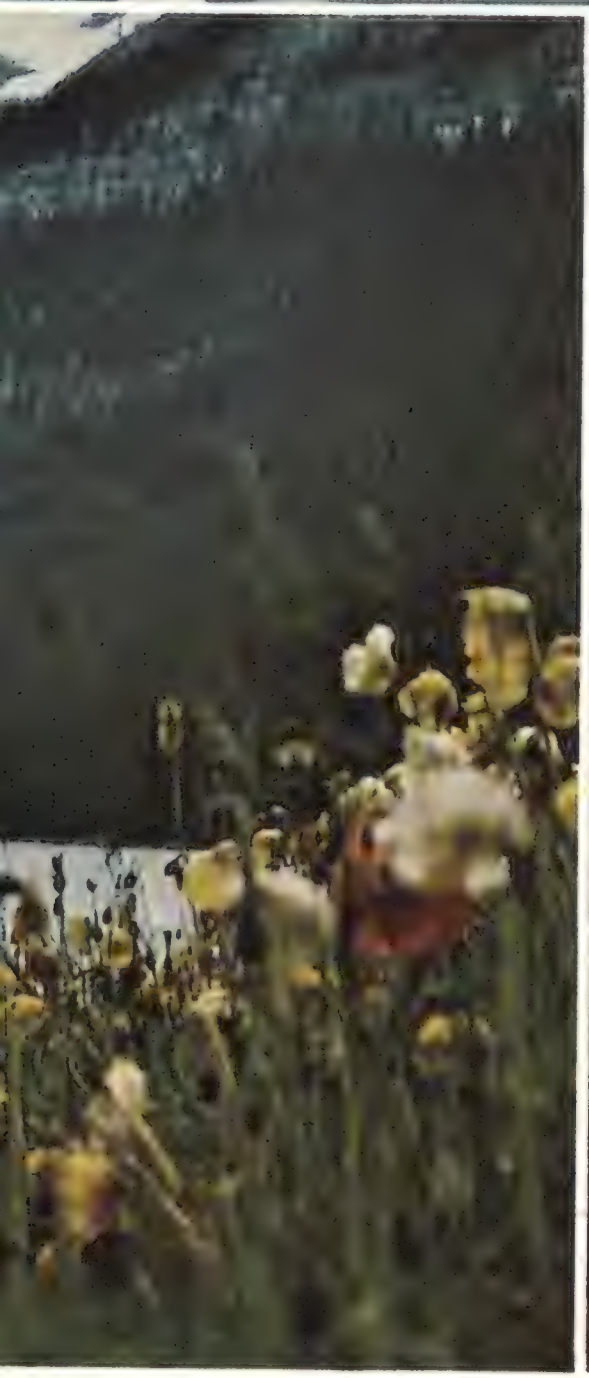

Mingle with the street artists in old Québec

By Robert Wernick

Risible, visible—who cares as long as it's fun

Heads which are houses, fly-winged toilets, donkey-backed desks, ostrich bars and landscaped women are work of les Lalanne

The puckish humor and unbridled inventiveness of the French artists François-Xavier and Claude Lalanne have charted a unique area on the fringes of the art world.

"Art world" is not a phrase that means much to these polymorphous creators. François and Claude produce objects, known collectively as *les Lalanne.* They are generally objects that can be used, and they are also decorative and eye-catching. To the question, "But is it art?" they shrug their shoulders. Their work is shown in fashionable galleries and in museums. The first museum show in this country was at the Art Institute of Chicago in 1967; a forthcoming exhibit is slated for this Spring at the Art Museum of South Texas in Corpus Christi. Their art is meant to render service, give pleasure. The Lalannes see themselves in the tradition of the medieval craftsmen-painters who spent most of their time on workaday commissions like designing gigantic meat pies for official banquets. In that painstaking tradition, every Lalanne is well-made; the parts fit precisely. The Lalanne bathtub, to take one example, will not leak. And, being a Lalanne, it is unsurprisingly in the shape of a hippopotamus.

People love to bathe in the hippo. Marcel Duchamp's widow, a neighbor of the Lalannes, owns one, and she finds her water bills going sky high, because houseguests like John Cage, the composer, spend all day splashing around in it.

It is the mad logic of dreams turned meticulously into solid metal. Sometimes it is a simple pun, as

This is, well, a hippo. It is also a bathtub. And a washstand. It is to laugh. It pleases you,

when François got to brooding on the fact that 18th-century cabinetmakers used to make a type of desk called, because of its high steep form, a *dos d'âne* or donkey back. So he made a desk which not only had a donkey back, but a donkey head, legs, tail.

Or a natural form may suggest some human attribute, or vice versa. If you want a safe to store your valuables, you want an object suggesting massive strength. What could be better for the purpose than the Lalanne one—a barrel-chested gorilla?

since it keeps you in the swim. This one is
in the bedroom of Marcel Duchamp's widow.

As in dreams, the Lalannes take an ordinary idea or image, play with it, rearrange it, transform it.

The Lalannes have been working together since the day in 1952 when they met at the opening of what was to be François' last exhibition of paintings. He had been struggling as a painter for several years, but to keep going he had had to take a variety of odd jobs. He had been a cowboy rounding up wild horses in the Camargue (the Rhone delta), a rug salesman, a guard at the Louvre.

Claude was a former art student who had worked for architects and sculptors but for years had led the conventional life of a housewife, raising three daughters.

Once together, they found they had a common taste and a common talent for putting odd things together in new and unusual patterns. They hired a studio and set up as decorators. They would take on any job, they said, that was too difficult for anyone else. No matter if they didn't know the necessary processes, they could learn as they went along. When they got

Photographs by Pierre Boulat

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A plaster model of projected Lalanne head-houses designed for seaside resorts. The dining room is in the mouth; spiral stairways climb spinal cords; chimney in nasal passage, music room back of ear.

a commission for a glass background for gems in a jeweler's window, they had to run out and learn how to blow glass. They soon attained the required skills. Over the years they have acquired an immense technical expertise in handling all sorts of materials.

In a few years they were fashionable themselves. They did windows for Christian Dior. They made stage props for television and for the Opéra and the Comédie-Française.

There is a family resemblance to all Lalannes, but François and Claude each have a personal style and distinct method of working.

Claude works in apparently helter-skelter fashion. Her studio, she says proudly, is a mess. It is one immense clutter of leaves, flowers, vegetables, stuffed animals and bric-a-brac of all kinds, which she keeps around till she finds ways of combining them in strange and unexpected ways.

Claude works with metals. Her basic technique is the old one of electroplating, which was popular with both decorators and printers in the last century. It is a comparatively simple process. She takes a natural object like a leaf, sprays it with silver salts, then dips it in a bath of sulfuric acid and copper sulphate. At each end of the bath is a copper anode. She shoots an electric current through the bath, and a layer of copper forms all over the surface of the leaf. She later burns away the vegetable matter, bronzes the copper surface, and there she has a bronze leaf, ready to be soldered to other objects.

François' approach to his work is much more orderly, neat and intellectual. When he gets an idea, he jots down a quick sketch, which is eventually transformed into a precisely scaled drawing. Then he builds his armature of steel wire and cuts out pieces of paper which are placed over the armature where the metal surface is to be. He traces the paper shapes on copper or steel or what not, cuts them out, hammers and beats and burns them into shape, finally puts them all together, solders them, *et voilà*: a rhinoceros, or a centaur, or whatever form fancy has taken.

All of these fancies germinate and take shape in the Lalanne household, a splendid old stone farmhouse in Ury, at the edge of the Forest of Fontainebleau

Robert Wernick, who lives in Paris, wrote about Diego Giacometti in SMITHSONIAN, *June 1975.*

Claude's daughter Caroline is sculpted pregnant and with a cabbage for a head. The parent's concept.

Here is Caroline's real head, which is to say, in copper, made from wax-molded life mask.

about 50 miles from Paris. Not all of them have yet gone out into the world; some exist only at the stage of sketches or plaster models. No golf course yet has had the vision or the cash to order the Feminine Landscape which François blocked out in 1974. This would be an artificial hill of gravel, covered with turf, anywhere from 60 to 600 meters long, in the shape of a reclining naked woman, with clumps of trees and bushes to represent the hair of her head and groin. It would put any male golfer on his mettle to hit a spoon shot straight and true between her billowing breasts. But the pleasure which has been denied to the golfers may be offered to automobile drivers, for François hopes to find a way to construct a Feminine Landscape alongside a new superhighway in the east of France to break the monotony which causes so many complaints from users of these roads.

Nor has there been an offer yet to put up a cluster of Lalanne head-houses, looking out to sea at some summer resort (p. 77). In these houses, the dining room is located, logically enough, in the mouth, the nasal passages provide a chimney flue, a spiral stair-

But of course, a toilet, a fly-winged toilet of solid brass and cobwebby wings of Plexiglas.

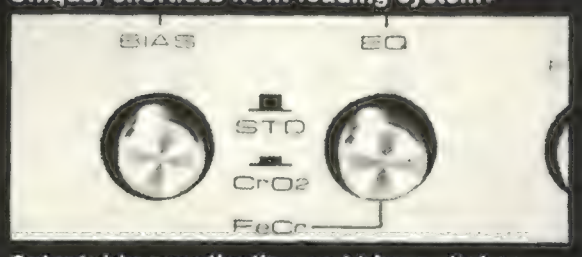
Pioneer's new 9191...the best cassette deck under $450† that money can buy.

Here is a magnificent cassette deck with specifications that are beyond what our industry had been aware were possible; specs that surpass anything that a deck of this price, performance and quality has ever been able to come up to before. Unbelievably low wow and flutter; solenoid controls that operate at a touch with almost magical precision, and a unique, truly-visible horizontal front loading system by which the cassette is effortlessly set into place with two fingers, are only a few highlights.

Pioneer's new 9191 incorporates a cascade of features and innovations: automatic CrO_2 tape detector and indicator light; an illuminated panel scale that lets you see at a glance the amount of tape remaining on a cassette; and an advanced memory rewind circuit that permits quick and easy location of (and automatic re-start from) any point on a cassette tape. It also has two independent drive motors, including an electronically-controlled DC unit for recording and playback.

Our engineers took into consideration the many types of tapes available and included superior bias and equalization circuitry and switching (in addition to the the automatic CrO_2 detection system) so that the 9191's recording capability is optimized for any kind of cassettes you want to use. And, of course, there's built-in Dolby B* to bring the 9191's S/N ratio up to 62 dB, even with standard tapes. We've also included separate mic/line mixing, and an extra pair of input and output jacks.

Unique, effortless front-loading system.



Selectable equalization and bias switches.

By now you realize that here is a cassette deck rivalling the performance of decks costing hundreds of dollars more; a deck whose controls make it respond faster than many reel-to-reel machines, and which offers greatly-extended frequency response and dynamic range. And it's the only front-loading, front-control, stackable deck to have all the features we've mentioned.

But of all the ingredients that make up the 9191: performance, reliability, style and features, the most important of all is its value. We set out to build a cassette deck that was better, but less costly, than any deck built previously. We know we have succeeded. We know that you'll agree when you see and handle the Pioneer CT-F9191 at your Pioneer dealer.

CT-F9191 Specifications:

Frequency Response: Standard, LH tape: 25-16,000 Hz (35-13,000 Hz ±3dB); CrO_2 tape: 20-17,000 Hz (30-14,000 Hz ±3dB)

Signal-to-Noise Ratio: Dolby OFF: More than 52 dB; Dolby ON: More than 62 dB (Over 5,000 Hz, Standard and LH tapes) More than 66.5 dB over 5,000 Hz with CrO_2 tape

Harmonic Distortion: No more than 1.7% (OdB)

Wow and Flutter: No more thas 0.07% (WRMS)

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*Dolby is a trademark of Dolby Laboratories, Inc. †The value shown is for informational purposes only and includes a cabinet with walnut grained vinyl top and side panels. The actual resale price will be set by the individual Pioneer dealer at his option.

Ministry of Health, Paris, ordered this bird, rejected it because some might take seed in bill for the Pill.

case winds around the spinal cord, a music room nestles just behind the left ear.

These are exceptions. Most Lalannes get snapped up almost as soon as they are dreamed up. They appeal to all sorts of people. They are fun to have around. Modernists and traditionalists can accept them with the same fond smile.

Georges Pompidou, the late president of France, put a Lalanne in the dining room of the Elysée Palace, the presidential residence in Paris. It consists of two porcelain ostriches looking at each other over their shoulders. Between their beaks is a metal tray on which glasses can be placed, as well as a large egg for ice or nuts; their bodies can be opened to be used as champagne coolers. When the more austere Giscard d'Estaing became president, he swept out most of Pompidou's far-out art. But he was amused by the ostriches: he has kept them on in one of the palace drawing rooms.

This general popularity is easy to explain. The Lalannes' combination of verbo-visual fireworks with meticulous craftsmanship is obviously influenced by the surrealists, but they wear their surrealism with a difference. The Lalannes don't go in for nightmares; they appear to have sweet dreams, though some of Claude's creations, like the pregnant woman whose head is a cabbage, have their inelegant sides as well. François' burly lumbering birds and beasts have a familiar barnyard air to begin with; they certainly don't mean us any harm. They have just enough of the bizarre to pique interest, stimulate a smile or a guffaw and perhaps a whole new association of ideas. They appeal to something childlike that lurks in all of us, a delight in the incongruous, a hankering for a world without the restrictive barriers of reason. No wonder virtually everyone likes them. No wonder Mrs. Duchamp's guests won't get out of that hippo.

Ostriches of Sèvres porcelain form a fanciful bar. One example, is part of Presidential Palace furnishings.

This is a centaur, *évidemment, à la* Lalanne. Claude sits on it. François rests. They are happy, *non?*

Gulf

"You can't tell a customer we're short of No-nox because of a foggy day in the Azores."

"That doesn't sound like much of a problem, does it?" says Operations Planning Supervisor Wayne Broussard. "A tanker delayed by fog.

"But for any refinery—even one as modern as Gulf's Alliance Refinery—a constant crude oil supply is essential. To meet customer demand for gasoline and fuel oil, it's necessary to have 200,000 barrels per day of crude oil supply.

Uninterrupted supply

"So even if a ship's held up only a few hours, you may be short several hundred thousand barrels of crude. The whole process depends on an uninterrupted supply. So you have to talk to the transportation and supply people to make other arrangements for crude oil delivery.

"And to make sure we meet product quality specifications, you have to refine different crudes or crude mixtures in different ways. That means changing process operations and product blends.

People vs the elements

"There's an enormous investment in hardware here at Alliance, but even more valuable are the people who make it all happen. Bad weather is just one of the challenges our people meet. But every day, all year long, we maintain the crude supply to produce 200,000 barrels of products.

"It's a real challenge—but that's the job: meeting the challenge, and doing it right."

Gulf

Gulf people: meeting the challenge.

"One day's delay could leave you short several hundred thousand barrels."

"You have to refine different crudes different ways to get the same product."

Gulf Oil Corporation

Mr. Justice Brennan, 70, is the Court's senior member, now in his 21st year on the bench.

Mr. Justice Stewart, 62, was President Eisenhower's fifth and last Court appointee, named in 1958.

By Richard L. Williams (second of two parts)

Justices run 'nine little law firms' at Supreme Court

Fiercely independent, staying at arm's length, members of 'Burger Court' manage to 'disagree without being disagreeable.' Here's how . . .

Spectators have to figure out on their own what is going on when Supreme Court Justices up front smile, frown, cup chins in hands, put on glasses to read, sip water from pewter julep cups or lean forward to question the lawyer at the lectern. The nine Justices sit for four hours on oral argument days. Like other mortals, they shift about in their chairs to ease cramped muscles. In a way they are a captive audience. The Chief Justice has remarked that "someone must have put crushed rocks in my cushion while I was at lunch."

The present case comes from Oklahoma. In that state, a girl can buy 3.2 beer at age 18 while a boy must wait until he's 21. Does this "gender line" deprive young men of equal protection under the Constitution? And may the Oklahoma legislature properly forbid Carolyn Whitener of "The Honk and Holler" tavern in Stillwater to sell 3.2 beer to 18-, 19- and 20-year-old males?

The case gets more complicated as opposing lawyers use up their respective half-hours of argument time. James H. Gray, the state's assistant attorney general, representing Governor David Boren and nine other officials, including Stillwater's Police Chief Hilary Driggs, tells the Court, "We do not think the right to purchase beer is Constitutionally protected." He cites statistics to the effect that young males drink more and have more accidents while drunk than do young females. "Perhaps," suggests one Justice, that is because "males are more frequently drivers than females."

Frederick P. Gilbert, arguing for "The Honk and Holler" and for Curtis Craig, the college student in whose name the action has been brought (and who already has turned 21), is making his first appearance here. He suggests that the disputed law really was retained, in 1972, at the urging of Protestant ministers and "to save the souls of young men 18 to 21 from exposure to pool, beer and girls."

There are other questions: Can 3.2 beer intoxicate anyone? Are the statistics about drinking and driving any good? Don't 18-year-old Oklahoma girls just run into the stores and buy beer while their boyfriends keep the motor running? Has the Supreme Court of the United States any business interfering in the pre-

Mr. Justice White, 59, notes a tremendous increase in the Court's work load since he came in 1962.

Mr. Justice Marshall, 68, is the first black ever appointed to Court, by LBJ nine years ago.

sumably rational legislative act of a sovereign state?

The Justices take a lively interest and so, from occasional titters (carefully ignored), do the spectators. A large section of pews in the courtroom is set aside for tourists who come and go, one row at a time, some allowed to stay only three minutes to make room for others lined up in the Great Hall outside.

When time is up the Chief Justice nods to the lawyers, saying, "Thank you, gentlemen, the case is submitted," and goes on to the next case. If one or more lawyers are women, "counsel" is substituted for "gentlemen." CRAIG V. BOREN, as the Oklahoma case is identified on the docket, has had its hour in court. Its fate: the Court later strikes down the discriminatory law.

That is the public side of the Supreme Court. No witnesses or jurors, but plenty of lawyers, from the perspiring barrister making his debut to the poised, morning-coated Solicitor General or one of his deputies arguing any case in which the United States is a party. The private side is something else, unique among all systems of jurisprudence ever devised.

"The judicial Power of the United States," wrote the framers in Article III of the Constitution, "shall be vested in one supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish. The Judges, both of the supreme and inferior Courts, shall hold their Offices during good Behavior, and shall, at stated Times, receive for their Services, a Compensation, which shall not be diminished during their Continuance in Office." Here is a look at how these "judges" function.

The Justices' chambers ring three sides of the courtroom floor, the fourth side being the main entrance, guarded by a pair of six-and-a-half-ton bronze doors and by police officers. Eleven Justices in all have chambers here, including two retirees, Justices Tom Clark and William O. Douglas, who get their office space as a government courtesy, since they "hold office" even after retirement. (A third retiree, Stanley F. Reed, recently moved out at the age of 92.) The two other living former Justices, Arthur Goldberg and Abe Fortas, have prosperous law practices in Washington.

Today's sitting Justices operate, some of them have said, as "nine little law firms." Little is right: two secretaries (the Chief needs and gets three), a messenger and three to four law clerks. The nine are together only at conferences (where no one else ever is present), in their upstairs dining room and in session. One may telephone or drop in on another's chambers to talk about a case, two may go out to lunch together —but this is rare—and a few may see each other at receptions, but generally, as Justice Byron White carefully phrases it, "We stay at arm's length," which preserves their fierce independence of thought.

At arm's length or less, at the beginning of each conference or court session the Justices perform a round robin of handshaking (pp. 92-93), a symbolic act testifying that they "may disagree without being disagreeable." Which of course has not always been the case. Once Justice James C. McReynolds was late to conference. Chief Justice Hughes said, "Go tell him we're waiting." The testy McReynolds sent word back: "Go tell the CJ I don't work for him."

At conference the Chief Justice presents a summary of each case in which some litigant seeks a Supreme Court review. An average of about 80 new cases are filed in each of the 52 weeks a year. These must be accepted for oral argument or a decision made to let

Photographs by Yoichi R. Okamoto

Mr. Justice Blackmun, 68, in cardigan sweater he wears when working in his chambers at Court.

Mr. Justice Powell, 69, starting his fifth year, often roams corridors in his shirtsleeves.

the judgment of a lower court stand. Rarely, the Court summarily reverses a "dead wrong" lower decision. Each week of oral argument 12 cases are presented. Four cases, argued the previous Monday, are considered at a Wednesday afternoon conference; eight, argued Tuesday and Wednesday, come up for decision at the all-day Friday conference—along with about 100 new motions, appeals and petitions.

Under the "rule of four," a gentlemen's agreement more than half a century old, four Justices can decide to accept a case for argument. Any one Justice may have a case put off for later consideration—unless there is some emergency requiring immediate action.

On the argued cases the Chief Justice, if he is in the majority, assigns the opinion-writing; if he is in the minority, then the senior Justice on the majority side assigns it. Each man is free to write a concurring or dissenting opinion.

For many years smoking was traditionally taboo in the conference room, part of the Chief Justice's chambers. Then, several decades ago, along came a chain-smoking Justice. At his first conference he lit up. Nobody said, "You mustn't," and there went that custom. Today several Justices smoke but they discreetly retire to a far corner for a few quick puffs out of deference to the majority. Two "smoke-gobbling" machines keep the conferring-place from being a smoke-filled room. No one would dream of smoking a cigar there.

The Justices have what amounts to a tenth "little law firm" at their service—two young legal officers. James Ginty worked as a Capitol Hill policeman while going to law school at Georgetown University, and later went to the Securities and Exchange Commission. Susan Goltz worked three years as an assistant district attorney in The Bronx, assigned to the appeals and rackets bureaus.

"Ginty & Goltz" function as "house lawyers" for the Court, the Clerk and the staff. They examine all of the hundreds of special motions and applications presented each year, some calling for a decision within hours. Might Senator Eugene McCarthy get on the ballot of state X as a candidate for President? Such urgent questions cannot wait long for an answer. Says Jim Ginty: "We're here to shorten the work for the Justices and the Clerk and relieve them of some of their burdens. As a term picks up, so does the pace." Says Susan Goltz: "We have little contact with the outside bar; we're very much the staff lawyers, very internal." Injunctions to force or prevent the disbursement of appropriated funds by a Cabinet member, "stays" of the prison sentences of criminals—these are their fare.

Being appointed for four years or more, Ginty and Goltz also provide a measure of continuity to the Court's revolving-door law-clerk system, as does Ken

Mr. Justice Rehnquist, at 52 youngest of the nine, was sworn in after Powell on same day in 1972.

Ripple, another dedicated lawyer who works as a special assistant to the Chief Justice. Although most law clerks serve for only one year, the practice of having some serve longer goes back at least to 1910. Charles Evans Hughes, William Howard Taft and Frank Murphy had law clerks who served five years or so.

The law-clerk institution was begun in 1882 when Justice Horace Gray hired a top Harvard Law School graduate to help him for a year. The clerks are invaluable to their bosses; the experience is invaluable to the clerks. Three present Justices began as law clerks themselves: Byron White, who clerked for Chief Justice Fred Vinson in 1946-47; John Paul Stevens, for Wiley Rutledge in 1947-48; and William Rehnquist, for Robert H. Jackson in 1952-53.

In late summer and early fall, when the machinery of the Court slips into higher gear before the new term, the new clerks arrive, many entering the building for the first time, not even having met their Justices, who may have hired them sight unseen on recommendation of other judges, law-school deans or selection committees. They have some overlap with departing clerks; they get a day of orientation from Officers of the Court; and suddenly, barely knowing the way to the snack bar, they are immersed in the high seas of work.

The work, oversimply put, is to read, analyze and

Mr. Justice Stevens, 56, the latest appointee, is doorkeeper at the Justices' closed conferences.

Attending an orientation session, the current crop of Supreme Court law clerks is the largest yet, 36, including three women (three of the group could not attend the meeting). All are graduates of

summarize the essence of all incoming cases and to write memoranda for their employers on the hundreds of problems—including "cert" petitions—seeking review by this court of last resort. Each Justice must decide for himself what course will be taken, but the clerks wade through the law books to find ammunition to buttress, even to debate, whatever opinion the Justice may reach. Generally, the clerks act as extensions of the cerebral "arm"—the brain and judicial personality—of the Justice.

The clerks have access to the top-floor minigymnasium (where Justice White, inadvertently of course, broke the leg of one of Justice Stewart's clerks in a basketball tangle last year) and the adjoining table tennis court, and have their own dining room. In the course of a term, each Justice is their luncheon guest.

"It is an irony of our system," says Justice Stevens, "that by the time the term ends the clerks are 'tigers'—and then they go away, to whatever may be the next step in their careers. An interesting loyalty develops between clerks and their Justices. It is much like a lawyer-client relationship, close and confidential. Like a lawyer, a clerk can't tell his client, the Justice, what to do. He can only suggest what can happen if he does or doesn't do something."

In his own first year—he has just entered his second and the first was only half a term at that—Justice Stevens was something of a tiger himself, writing a flock of dissenting opinions.

On the United States Court of Appeals, sitting in Chicago, Stevens felt the ambience of unanimity was comforting to bench, bar and the public. On the Supreme Court he has come to feel that if one disagrees, one has a duty to say so and why, because every differing shade of opinion should be out in the open—and also because many dissenting opinions upon the Court's reconsideration eventually become majority opinions and so automatically the law of the land.

As a law clerk three decades ago, Stevens sensed real rancor and bitterness among some Justices of those post-World War II, post-FDR days. Now that he has graduated to being one of The Nine: "I was frankly skeptical that it could all be so friendly, but they couldn't have been more gracious to me. I genuinely *like* everyone on this Court."

Perhaps this is so because in times past internal frictions marred the Court's image—and its work. Justice Robert H. Jackson feuded in the public prints with Justice Hugo Black. And one Justice, notoriously anti-Semitic, actually would turn his back on Justice Benjamin Cardozo at conferences.

As the junior Justice, Stevens tends the door at the conferences, receiving and sending messages that come and go via knocks on the door. Years ago Justice Tom Clark had his turn at that chore, and says of it wryly: "For five years I was the highest-paid doorkeeper in the world." The junior Justice also sits with the Chief and with Mike Rodak, the Court Clerk, at the end of each conference, helping draw up the Order List that summarizes the multifarious decisions just arrived at, for announcement the next Monday.

For almost four years before Stevens' arrival, it was Justice William H. Rehnquist who had the "junior jobs." He, as it happened, was sworn in on January 7,

law schools that turn out 30,000 a year. Many of this term's legal eaglets served judges in lower courts last year; clerking at Supreme Court is a ticket to a bright legal career.

1972, a few minutes after Lewis F. Powell. He says he really didn't mind his doorkeeping, or being in charge of the reception for new law clerks in October and the Court's Christmas party for the staff, but "I was glad to see John Stevens take over."

As a brilliant Assistant Attorney General in 1971, Rehnquist "was helping winnow the list of possible appointees to the Court. Then one day Mitchell and Kleindienst told me, 'You can't join in with us today—*you* are on the list.' " Two days later, he was nominated. Having worked in the Carswell and Haynsworth confirmation fights, he knew what was coming. Still, his own confirmation process (October 21 to December 10, 1971) seemed endless. Twenty-six Senators voted no, but Justice Rehnquist can comfort himself: "The same number (in a smaller Senate) voted against Charles Evans Hughes for Chief Justice."

He regards his official Supreme Court photograph as being too sobersided, too much, as a friend put it, "like a hanging judge." He is, in fact, a big, outgoing, affable person, and many photographs do not do justice to his easily animated face. He has a Lone Ranger doll, in sky-blue costume, on his mantelpiece. His law clerks gave it to him in 1975 for being "the lone dissenter," when he wrote 11 dissenting opinions.

Justice Powell, the man who missed by minutes being the conference doorkeeper, is a Virginia gentleman who works during summer recesses in the federal courthouse at Richmond. Across the street he can see the state capitol that Thomas Jefferson designed. Six blocks away is the historic house of Chief Justice John Marshall, fourth of the line, who was appointed by President John Adams and served for 34 years.

Lewis Powell is the only present Justice to have been appointed while a practicing lawyer, and he has been quite candid about the drastic changes in his social and working existence that ensued after "life began again for me at 64." He poignantly misses friends with whom he and his wife were free to spend time before the lightning struck.

"I had thought of the Court," he told an American Bar Association meeting last summer, "as a collegial body in which the most characteristic activities would be consultation and cooperative deliberation, aided by a strong supporting staff. I was in for more than a little surprise," for he found out that the Justices, with some help from their clerks, really do their own work.

"The Court," he went on, "is perhaps one of the last citadels of jealously preserved individualism. . . . Indeed, a Justice may go through an entire term without being once in the chambers of all the eight other members of the Court. . . . I think I missed the adequate staff of a modern law firm even more than I missed sending out bills to nervous but solvent clients." The conferences, he says, "afford the principal opportunity for discussion, debate and group deliberation. Justices may speak as frequently and as long as they wish . . . and not infrequently a conference has altered my original tentative view."

Brevity, the soul of Holmes' wit

Justice Harry A. Blackmun, like the Chief Justice, grew up in Minnesota and was for ten years on the staff of the Mayo Clinic in Rochester. Working in his chambers, the only office with pale tinted walls, he wears a brown or dark blue cardigan, sometimes standing at an old counter-height desk he rescued from the junkman at the Federal Building in St. Paul. He keeps in mind Justice Holmes' realistic observation that "there is nothing so conducive to brevity as a caving in at the knees." For brevity, nothing ever beat Holmes' words to his brethren announcing his retirement in 1932: "I won't be down tomorrow."

Four years ago Justice Blackmun wrote the Court's first opinions in abortion cases. He did not volunteer for the task—it was assigned to him—but he says, somewhat ruefully, "I still get picketed here and there." So do his colleagues. Once at New York University the Chief Justice was picketed simultaneously by "right to life" protesters and by a gay liberation group.

Justice Thurgood Marshall, now in his tenth year

on the Court, feels eminently comfortable in its halls. He used its library while a law student at Howard and as Solicitor General argued cases here for two years prior to his appointment. On the bench he can wear a doomsday look while barking at lawyers like some dark Perry Mason, but in chambers his conversation may be spiced with rapid-fire, good-humored anecdote, spilling out of a reservoir of total recall.

Along with most of his brethren, Marshall would welcome a woman Justice someday, and as his sometime luncheon companion (and more frequent liberal-voting companion) Justice Brennan adds, "the sooner the better." Marshall recalls that "LBJ busted his gut trying to get a woman on the Court, but never made it." One of the three women law clerks this term, Susan Bloch, works for Justice Marshall, who says of her admiringly: "She got two Bs in law school—her *low* grades!" He keeps reminding his clerks, "If you disagree with me—and go ahead—*I'm* right."

Last summer, two days after his 68th birthday, Justice Marshall suffered a heart attack during the July 4 weekend, but has bounced back to carry his full load of work, incidentally carrying less physical weight ("They wanted 40 pounds, I'm giving them 20") and cutting his smoking from two packs down to three cigarettes a day.

Justice Byron R. White is the apotheosis of the All-American boy grown up: a Phi Beta Kappa and All-American football star at Colorado, whence the nickname Whizzer; a Rhodes Scholar, pro football player with the Pittsburgh Steelers and Detroit Lions, Naval intelligence officer in World War II, law clerk for Chief Justice Vinson. Nominated by President Kennedy in 1962, he is first former law clerk to become a Justice.

"There's been one overriding practical change since I came here," he says, "in the Court's much larger docket of cases. Last term we denied 3,800 of them. Also we're writing about a third more signed opinions [since the 1950s, a half more], averaging about 140 a year. Everyone is busier, writing more. There is a good deal of pressure; there are some dissents that I might have written that I have abandoned because of this."

Justice White is not concerned that the Court will ever be too directly swayed by the winds of public opinion. "Expediency doesn't cut much ice around here; the Bill of Rights is an antimajoritarian rule." At the same time and taking the long view, he recognizes that Supreme Court decisions do not last forever if they are not in tune with the beliefs of the people. "This Court has overruled itself more than 150 times since 1789: Justices will change their minds, and new Justices do come along; they renew the Court."

As an ex-clerk (and, incidentally, the only Justice who has yet to hire a woman law clerk), he has a kind word for that anonymous calling: "We couldn't get our work done without the clerks. But I don't think they influence the results here all that much. I like 'em around to hear their various views. When I served as a clerk, I don't think anything I ever did or said influenced my Justice. I felt I was doing Chief Justice Vinson a service by making sure that relevant considerations were placed before him, such as opinions

Queue of tourists, in Great Hall outside courtroom, will be admitted to hear a case being argued.

from other courts, law journals, ideas of my own—things he wouldn't have time to dig up on his own."

Justice Potter Stewart came to the Supreme Court from the Sixth Circuit Court of Appeals in Cincinnati, where at age 39 he began work as the youngest federal judge (at that time). "I had the distinction of serving there with the late Florence Allen, the first and then only female circuit judge. FDR had appointed her—she was a product of the latter-day suffrage movement—and she once said Eleanor Roosevelt had promised her appointment to the Supreme Court." (Roosevelt died before that might have happened.)

"One characteristic of this place," Justice Stewart reflects, "is that one is not his brother's keeper. At times, except for the conferences, I hardly know what the others do." The Justices are that busy, as well as that independent. In his own chambers, where he has three clerks and shares a fourth, "The real bottleneck is *me*. If I had 100 law clerks it would be easier for them but no easier for me."

Briskly busy as he is, the Justice, by appointment, sometimes pops into a conference room to speak to some visiting group, tailoring his remarks on the Court and its work to his audience of Boy Scouts, wives of foreign diplomats, pre-law students, or whomever.

At 70, William J. Brennan jr. is the oldest Justice and the senior one in service: last October 16 was his 20th anniversary on the Supreme Court. Usually on that date, he and Mrs. Brennan spend the evening with Justice and Mrs. Douglas; this time Douglas, whose birthday it is, was too ill.

He has been called the "poor man's judge" because he personally reads all the pauper petitions that rain in on the Court. "I read the rich man's *and* the poor man's," Justice Brennan points out by way of correction. "Reading them myself saves time; I know what I'm looking for and I can readily detect new trends coming our way." But then, so do the others; it is fairer to say they are *all* poor man's/rich man's judges.

The annual caseload has doubled since Justice Brennan came to the Court and he, like his colleagues, has had to shift to a most rigorous life-style. He tries to be in bed by 9, is out for an hour-plus walk at 5:30 ("President Truman's physician got me started walking") and gets to his office by about 7:30. He works part of every Sunday, and has declined extracurricular speaking engagements for seven years. At Nantucket, in the midyear recess, "I take two months of summer to recuperate" while the walking, and working, go on.

All nine Justices share an added burden, to oversee one or more of the 11 U.S. Judicial Circuits and their Courts of Appeals. (The Chief Justice and Justice Brennan have two each.) Ordinarily a Justice is assigned, by the Chief, to a circuit where he has a special background; thus Justice White, a Coloradan, has the 10th Circuit, headquartered in Denver. Emergency motions that come to the Court usually are presented to the appropriate Justice; and thus it was to Justice White, whose circuit includes Utah, that the mother of condemned Gary Gilmore—who wanted to pay the death penalty—appealed in December for a review of her son's sentence.

A penchant for going to jail

Chief Justice Burger, who perforce sets the pace for all the Justices' grinding labors, is like them a workaholic, not by choice but out of necessity. (Justice Douglas used to scoff that he could get through his week's work in four days, but nobody else has found that remotely possible—and no other Justice took his statement seriously.) The Chief estimates that nearly a third of his own time is spent on administrative duties that do not directly concern his brothers.

One such duty, acting as an emissary of the American judiciary, has taken him on three long trips since 1969, to Japan, France and Sweden as guest of their highest courts. The trips usually include lectures on the American system, given at leading universities. While in Sweden last fall he revisited a number of prisons, as he has done for many years, to see for himself the conditions under which the inmates—society's losers—are kept locked up. The Minister of Justice of Sweden, introducing him at a dinner, said, "He has

been in more Swedish jails than any of our criminals."

A history buff and a prowler after antiques, the Chief spends summer weekends working in a screened-in porch off the dining room of his home in North Arlington, Virginia. The table is laden with books. When he looks out he sees many of the varieties of flowers—geraniums, impatiens, hosta—that he has planted around the grounds on various mornings between 5 and 7 o'clock. Located in the center of seven acres, the comfortable home has plenty of privacy—a factor Warren Burger and his wife Elvera cherish.

As Assistant Attorney General under Herbert Brownell in the Eisenhower cabinet, Burger conducted many cases in the trial courts, courts of appeals and the Supreme Court. He handled the unique cases against the late Aristotle Onassis, Stavros Niarchos and others, proving they had illegally bought surplus American tankers after World War II. The cases resulted in recovery of more than $35 million.

He was somehow reluctant to mount the federal bench. Resigning from the Attorney General's office in 1956, he first declined, finally accepted Eisenhower's request that he go on the U.S. Court of Appeals in Washington. Thirteen years later he was appointed Chief Justice. In the years since 1969, the Chief has become almost as proud of the accomplishments of the Judicial Conference, which he heads, as of anything else. "More than 200 judges serve on working committees of the Conference," he says. "Their efforts account for an increase in per-judge output of 34 percent in the past six years, a record not equaled anywhere else in the government. And all this," he adds, "while these judges were denied pay increases to keep up with rising living costs." Those costs have risen 65 percent, while federal judges have had one net salary increase of 3½ percent. (Associate Supreme Court Justices are paid $63,000 a year; the Chief Justice earns only $2,600 more.)

In the past 86 years two events have helped to lighten, if only temporarily, the inexorably growing work load of the Supreme Court. The first change was Congress' creation, in 1891, of the Circuit Courts of Appeals, which winnow out hundreds of cases that otherwise would land in the Justices' laps.

The second was the Judiciary Act of 1925, advocated by Chief Justice Taft, which gave the Supreme Court much-needed discretionary power to reject some, instead of having to accept all, petitions from losers in lower courts. Another proposal—still pending in Congress—would create a national court of appeals to settle differing results on the same points of law in the various circuits. Most of the Justices favor this but some are strongly opposed.

This year, as every term, there is wordy speculation in the press, at law schools and among Court watchers generally about where the "Burger Court" is heading. Left or right, or steady on center? Liberal, toward greater activism, or conservative, toward greater restraint, greater deference to the states? Toward greater press freedom, or greater protection for trial defendants? More rights for the police, or for the robbers?

The evidence is that the Burger Supreme Court is at least consolidating, if not minimizing, the strides toward defendants' and others' rights taken by the Warren Court. Still, the evidence is contradictory and it is not all in. The present Court is not by any means as "strict-constructionist" as perhaps Richard Nixon hoped his four appointees would make it.

Two things at least are beyond question. One is that a President cannot always have his say and his way. Theodore Roosevelt, who appointed Oliver Wendell Holmes, later complained: "I could carve a judge with more backbone out of a banana!" Harry Truman

A handshake all around is a ritual before going into courtroom. This is a record-breaking reenactment because actual event is never witnessed by outsiders.

nominated Tom Clark—who coolly voted against his sponsor in the 1952 steel-plant-seizure case. And there was that unanimous decision against Richard Nixon in the matter of the tapes—written by the Chief Justice he had appointed.

Some activists criticize the present Court for "denying access" to the disadvantaged. Other observers point out that this Court has decided more cases than at any period in history in favor of equal treatment for women, for racial minorities, for prisoners' rights, for equal legal status for illegitimate children and a host of other disadvantaged groups. One Justice concedes: "The more rights we recognize, the more people demand—but that's the American way."

The other unquestionable thing is that the Constitution, its ten-amendment Bill of Rights and its other amendments are still very much alive and kicking, subject to new and, some would say, tortuous interpretation. The Chief Justice is proud that his birthday (September 17) is Constitution Day. Like his friend, the late Justice Black, he carries with him a much-thumbed, pocket-sized copy of the Constitution, with passages marked for emphasis with a yellow felt-tipped pen. He has noted with a smile that in the document's main reference to the institution he now heads, "supreme" is not capitalized but "Court" is. He wonders, at times, was that an accident or done on purpose, and if so, why? Either way, the awesome responsibility is there: Supreme.

It is far more so than Thomas Jefferson, among others, wanted it to be. By its very power it has blunted issues that, without such a Court, might have precipitated wrenching Constitutional crises, and even worse.

Had the Court not ordered the production of the famous tapes in 1974, who can say what disasters might have been visited on the country by an unrefereed battle between the President and Congress, culminating in a long-drawn-out impeachment trial before the Senate? Such a trial could have consumed many months during which neither the executive nor the legislative branch could properly perform its duties.

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By Maureen Green

Pevsner choices among the fine English buildings

After 46 volumes of comment, Sir Nikolaus is busy as ever and would like to prod someone to survey the buildings of America

Pevsner (above) chose the buildings shown in these pages as among the most interesting in England.

There was a knock at the door of the Elizabethan farmhouse. "Excuse me," said a tall, scholarly-looking gentleman in a perceptible foreign accent, "I am interested in old buildings. May I look at the outside of your house and take some notes?" The owner was delighted. After ten minutes or so, if the owner had not thoughtfully asked, "Would you like to see the inside of the house as well?" the visitor prompted, "You haven't got a nice-looking staircase too, have you?" and gained admittance. With such seemingly casual arrivals—in fact, part of a cast-iron schedule that would have been ruined by too many set appointments—Sir Nikolaus Pevsner has surveyed, catalogued and commented on virtually every building worth looking at in England.

His perambulations have assured Sir Nikolaus an indisputable immortality. The 46 volumes of his *The Buildings of England* have been greeted as a work of reference of a magnitude that no other scholar is ever likely to have the ability or the courage or the need to attempt again. Although an official inventory of every English monument has been undertaken by the Royal Commission on Historical Monuments, it is estimated that they will need another 400 years, at the very least, to complete their task. In the meantime, visitors and students with interests in architecture will set off to explore the English shires with a "Pevsner" in the pocket of the car.

Wollaton Hall (1580) in Nottinghamshire is unique because its four sides are nearly identical.

The prodigious task which Sir Nikolaus Pevsner set himself, and has completed in the second half of his lifetime, has thrown his many other achievements not into insignificance, but into shadow. The colossus that is "Pevsner" has made the other life of Sir Nikolaus—as professor of fine art, lecturer, writer of many other books and articles, editor of the *Architectural Review* and president of the Victorian Society—seem almost ordinary alongside it. The fact that he has achieved both careers simultaneously seems the more staggering. When he says today, in his precise way, *"The Buildings of England* took half of all my time and thought over the last 25 years," it takes a while for that statement to be fully understood and calculated into comprehensible man-hours. To produce these volumes that cover every English county—the final volume on Staffordshire appeared in 1974—some 80,000 miles were covered by car and on foot, some eight-and-a-half million words written, and countless buildings assessed by the piercing Pevsner glance before inclusion in the guide.

In all, 35 of the 46 volumes were written by Pevsner himself. After the death of his wife, who had acted as

Photographs by Farrell Grehan

Lincoln Cathedral's "crazy vault," as it has been called, crowns the nave, begun in 1192. It is important for decorative quality of rib-vaulting.

Sir Christopher Wren's Trinity College Library, Cambridge, completes fourth side of arcaded court.

his driver and helper, 14 years ago, a number of other architectural historians were invited to write half a county or a whole volume to speed the enterprise to its conclusion. The last volume, however, like the first, is all Pevsner's own. In it he writes, "I have myself seen everything I have described."

The monument that is "Pevsner" is now taken for granted and constantly referred to for any number of purposes. Obviously, it is indispensible to those working on art and architecture. "If a student asks me how to get into a subject like English Gothic, I tell him to begin by going through *The Buildings of England,*" says one University of London lecturer. For owners or estate agents, for citizens fighting off highway development that might threaten the church of a country town, to be listed in "Pevsner" is a source of pride and strength. A few years ago, the critic Cyril Connolly recommended distinguished colleagues of his generation to peruse "Pevsner" before selecting London churches for their own memorial services, since it would be a final courtesy to friends to choose something interesting for them to look at even after one's own departure. (When Connolly died in 1974, he had chosen St. Mary-

Maureen Green, who lives in London, frequently writes for SMITHSONIAN. *She described the restoration of* The Night Watch *in June 1976.*

Of this great building Pevsner writes: "It made everything built to that day look fussy and finicky."

le-Strand for his own memorial gathering, mentioned in Pevsner as "architecturally surprisingly plain.")

Though Sir Nikolaus Pevsner has always tried to dispel any claims to infallibility for his books, he is now occasionally uneasy at the immense reputation they have acquired. From the beginning he maintained that the scale of the work he was undertaking condemned him to be "a man who perpetually makes errors," and every volume of *The Buildings of England* has always carried an appeal to readers to point out mistakes and omissions (which they do). Yet, today, when Sir Nikolaus attends a meeting of the Historic Buildings Council to judge with fellow members the pleas of owners of important country houses for funds toward the upkeep of their possessions, he glances at the agenda on the table before him and notes with alarm that each building to be discussed for a grant is asterisked and accompanied by a footnote: "Not listed in Pevsner" or "Listed in Pevsner," with the volume and page reference.

The man who constructed his own monument by surveying all the other monuments has been known throughout his lifetime as a dauntless scholar, a constant source of lively and original ideas on the arts, always indefatigable and precise. The story has often been told of Dr. Pevsner's visit to see Kenneth Clark, then director of the National Gallery, when he was

Pevsner admires these towers for their setting and because detail "gets closer to Mies van der Rohe's immaculate purity than any other . . . in London."

first settling into his career in England. While he was waiting for Clark to appear, Pevsner perched on a chair and wrote furiously in his diary, which meticulously controls his life. So busy was he that he did not hear the director approach and only looked up when Clark placed a hand on his shoulder and prophetically greeted him: *"Immer fleissig, Herr Doktor, immer fleissig"* (Always busy, always at it).

From his earliest days Pevsner was a devoted student of things English, and one senses that he has felt a mission to coax the English out of their deep-seated inferiority complex about their artistic and architectural achievements. That the writer of *The Buildings of England* was born not in England, but in Germany, may at first seem an ironic accident. But it was in two ways an essential ingredient of his achievement. First, as Pevsner once wrote in the introduction to *The Englishness of English Art,* "The very fact of having come into a country with fresh eyes at some stage and then of having settled down gradually to become part of it, may constitute a great advantage."

And again, on his first arrival in England in 1929 at the age of 27, to look at background for his lectures on English art at Göttingen University and at the Dresden Gallery, he asked "Where is your Dehio?" In Germany, the handbooks of Georg Gottfried Dehio, a five-volume guide to the medieval architecture of the German provinces, were a basic scholars' aid. Pevsner was told that nothing of the kind existed.

When the rise of the Nazis impelled him to leave Germany in 1933, it was to England that he came. As soon as he had found a first job, as buyer of pottery and textiles for Sir Gordon Russell's modern design store, and had purchased a dilapidated Victorian house in Wildwood Terrace on the edge of Hampstead Heath, he was able to send for his Jewish wife, Lola, and their three children to join him.

Today, just turned 75, Sir Nikolaus Pevsner sits and talks, his tall frame a little stooped, in one of the old family chairs in the drawing room of that same house.

Looking back, Pevsner minimizes the strains the family had to undergo in sudden exile. True, his appreciation of the architecture of the Victorian age, and his interest in modern buildings—both unusual and in advance of English taste at that time—were soon known about in academic circles, and he was given a research post to write *An Enquiry into Industrial Art in England,* a book full of original questions about the relationship between industrial firms and their design ideas. But the Pevsner family, in some poverty, had to clear the cockroaches out of their basement themselves, and make a good deal of their own furniture to survive. When the war with Germany finally came, Pevsner was out of a job. "I worked cleaning debris, bomb damage, from the London streets." At the same time he was invited to give weekend lectures in the history of art at Birkbeck College, the only part of London University that did not evacuate. After a while, the authorities at Birkbeck suggested that it was a little preposterous for Dr. Pevsner to be wandering the streets of London with a wheelbarrow all week, and offered him the princely job of full-time firewatcher at Birkbeck, as well as lecturer in art.

The blitz brought him face to face with Allen Lane, the creator of Penguin Books. Lane visited the house of one of his editors, Elizabeth Senior, to go through her papers after she had been killed by a bomb. Among them there was a letter from Dr. Pevsner, telling her that the quality of color printing in King Penguins (small art handbooks) was so poor that he did not wish

Seaton Delaval, designed by Sir John Vanbrugh. Pevsner calls it "a monument of Baroque grandeur and passionate power unmatched in England."

to write a book on illuminated manuscripts for the series. Pevsner recalls: "Allen Lane found my letter and wrote me a typical Allen Lane reply: 'I note your criticisms. Would you like to come and edit these books yourself?' "

From this accidental beginning came one of the most fruitful alliances in postwar British publishing. As Pevsner tells it, "He said to me, 'If you had a free hand, what would you want to do? Think about it and let me know.' I told him that I already knew. I suggested a series of major volumes by international specialists which became *The Pelican History of Art*, which I edited. And, remembering the handbooks of Dehio, I told Allen Lane that I would like to write a series of guidebooks to the buildings of England. Those two projects altered my life."

A good but unprofitable author

Along the way, they have brought him innumerable international honors, a knighthood, occasional despair and no money. Sir Nikolaus Pevsner has worked without royalties on *The Buildings of England*, paying his own expenses; and when, after volume 12, the series was £36,000 in the red and momentarily Allen Lane's nerve failed, Pevsner successfully appealed to a charitable foundation, the Leverhulme Trust, to rescue the enterprise. Though *The Buildings of England* now makes a profit, and Penguin Books is constantly revising and reprinting them, there was a time when Allen Lane introduced Pevsner at a banquet as "my best losing author."

Looking back today, Pevsner seems both pleased and irritated by his other big project, the 50-volume *Pelican History of Art*. Several books in the series have been works of great distinction; others have never come out at all. "I have some authors who are ten years behind their schedules," he sighs. But the expansion and final completion of *The Buildings of England* gives him immense satisfaction. "Of course, I thought that I would write it all," he says, "but at the beginning I never imagined that there would be so many books. I thought that we could cover two counties in most volumes; but towards the end we were finding that counties like Kent and Gloucestershire demanded two volumes each."

Knowing what to leave out, Pevsner believes, was one of the crucial bases of the practical success of the series. As the first line of his *Outline of European Architecture* expressed it: "A bicycle shed is a building; Lincoln Cathedral is a piece of architecture."

The volumes of "Pevsner" are never mere catalogs but alive with one man's knowledge, opinions and passions; his humor and his hobbyhorses keep breaking through. His special interest in Victorian build-

Ruins of Fountains Abbey, Yorkshire, founded in 1152 in a place "fit more, it seemed, for the dens of wild beasts than for the uses of mankind."

Angels with outspread wings are a feature of "the gorgeous timber roof," as Pevsner calls it, in the small church of St. Wendreda, Cambridgeshire.

ings is everywhere apparent and gets the city of Liverpool 120 pages. Pevsner's profound admiration for English medieval churches has never wavered from the first moment, and he considers the great body of perfectly preserved parish churches the greatest treasure of England. His curt dismissals of the appalling are sharp. Of the artillery memorial on Hyde Park Corner, he wrote, "An ill-advised portrait in stone of a big gun."

The way that the Pevsners gave themselves up to their fate, and reorganized their lives around *The Buildings of England,* became a byword. Pevsner maintains that the "organization was really very primitive; we had half a secretary and two researchers, each taking a year to prepare lists of buildings for one county. When a county was researched, I took over and went there, and my wife did the driving."

But such a brisk summary gives no flavor of what life was like once the Pevsners took to the road. Staying at tiny country hotels and pubs, the Pevsners rose each day at 7 A.M., made sandwiches, packed a flask of tea, breakfasted and were on their way by 8:30, the car piled high with ordnance survey maps, boxes of research lists, binoculars and a flashlight. From then on, with Mrs. Pevsner driving and Pevsner holding his notes, they would crisscross the countryside from parish church to local grand residence to country library to, on one occasion, a newly designed gentlemen's public lavatory.

The afternoon ended at about 5:30 and the Pevsners pulled into any small pub or hotel that seemed convenient. Each evening in the hotel he wrote up what he had seen that day, producing finished copy that, apart from a few checks, was ready to be typed for the publishers. He worked well into the night.

"We never accepted invitations to dine when we were working," says Sir Nikolaus, "because the next day's work would have been ruined. We were invited to stay with the Howards at Castle Howard, with the Bedfords at Woburn, but we had to say 'No.' " To the interviewer who asks if the Pevsners could not have relaxed for one evening for the harmless pleasure of dining with a duke, Pevsner replies, pleasantly but firmly, "Yes, but then I would have completed five volumes in this series and not thirty-five."

After the death of his wife, he found young postgraduates to drive him and help in his surveys. Neil Stratford, now Keeper of the Department of Medieval and Later Antiquities at the British Museum, recalls that his one source of disillusion was what he was required to eat. "It was dreadful," he says. "I foolishly took the *Good Food Guide* with me and I think we used it once. Sir Nikolaus Pevsner is very austere about his food. As long as he has ice in his water and decent brown bread he doesn't mind." In the Introduction to a late volume, Pevsner thanks Neil Stratford for his help, and notes that the young man "stood up well to the culinary deprivations."

Now that the task is done, *The Buildings of England* complete, the celebrations over, Sir Nikolaus Pevsner admits to "an immense feeling of gratitude to Providence that I have lived to finish it; if I had not finished it, I might have wondered if I should have spent my time in other ways." As it is, he can now contentedly pursue his other multiple interests. A new book, *A History of Building Types,* based on the Mellon Lectures he gave at the National Gallery of Art in Washington, which gathers together his thoughts of half a century on the special qualities of buildings, is being readied for publication.

Sir Nikolaus Pevsner has perhaps one ambition left: to encourage or sting some scholar into action to do for the buildings of the United States what he has already done for the buildings of England. Half-puzzled, half-amazed, he wonders why he has not so far found a man willing to lay down most of his scholarly life for guaranteed immortality. "Perhaps it is unlikely that this mania," he says, "this passion will strike another person in the same way. But just imagine what could be done with the buildings of the United States of America!"

Osterley Park, Middlesex. Robert Adam's design is notable for its originality; he placed a big classical portico before a large open courtyard.

Sir Nikolaus now works at a table in his kitchen. It has not been used for cooking since his wife died in 1963—but utensils still hang on the walls.

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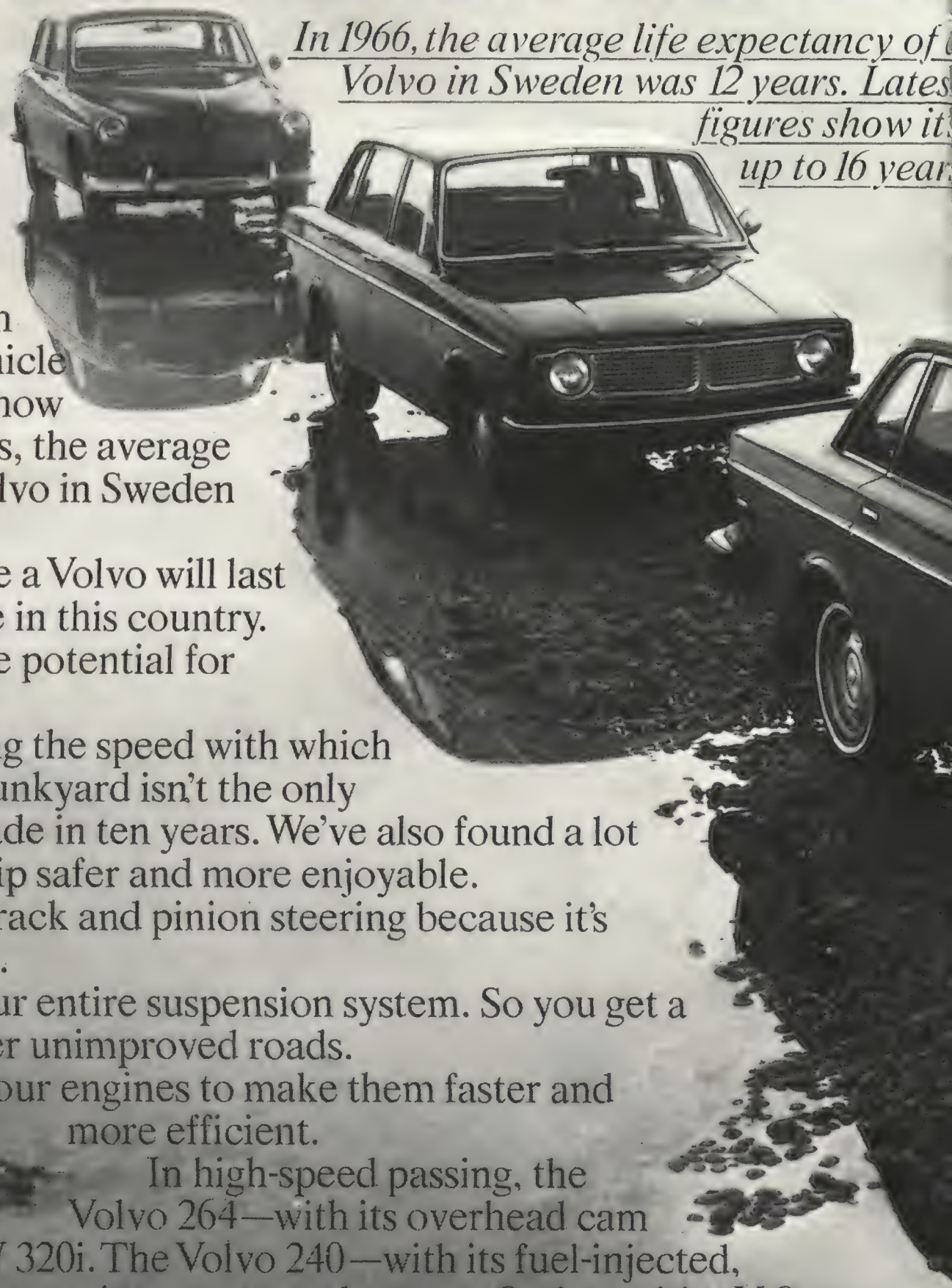

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At The Scales, a way station half a mile below Chilkoot summit, resting climbers and gear clutter a mountainside basin as hundreds more strike out in 1898 assault on "Golden Stairs."

By Jack Hope

Scaling Chilkoot even today is a fearful ordeal

Somehow 30,000 gold rushers survived the 1897-98 ascent of this pass to the Klondike; so did a group of modern adventurers

Word of major gold discoveries in the wilderness of Canada's Klondike region reached the outside world in July of 1897. Soon thousands of prospectors, entrepreneurs, con men, prostitutes and soldiers of fortune were on their way to the permafrosted landscape of northwest Canada, in one of the most dangerous human adventures in North American history.

Most were Americans, and the route they took to the Klondike—in what is now west-central Yukon Territory—involved ocean, overland and river travel. From Seattle and San Francisco they sailed north to the Alaska panhandle towns of Dyea and Skagway. There they packed their gear 32 miles up and over the snow- and glacier-covered Coast Mountains and into Canada, stopping at Lake Lindeman or Lake Bennett, at the headwaters of the Yukon River. Through the winter of 1897-98 they built 8,000 boats and rafts from nearby timber, and with the spring thaw they floated another 560 miles downriver to the new, gold-born town of Dawson, where the Klondike River joins the Yukon and where an almost limitless supply of gold nuggets was said to lie.

Throughout, the gold rushers (or "stampeders") were beset by disease and malnutrition, by shysters and natural disasters, and by their own lack of knowledge of how to survive the winters of the sub-Arctic.

Jack Hope, author of Yukon *(Prentice-Hall, 1976), has lived in Dawson, and panned for gold near there, but makes his living as a writer.*

Packed with gold hunters, a northbound steamer pulls away from a crowded Seattle pier in 1898.

Members of modern expedition, straining behind four-dog

All stages of the trip were painful, but most painful of all was the overland stretch from the Pacific, through the cold, avalanche-pounded Chilkoot Pass.

The Chilkoot, a notch through surrounding 7,000-foot peaks, is only 3,500 feet above sea level, a mere 16-mile hike from tidewater. But the last stages of its approach are pitched so steeply that a man can reach out and touch the slope in front of him with only a slight bend at the waist. In winter—when most stampeders made the climb—temperatures on the Chilkoot drop to 30 below and 30 feet of snow accumulates.

More than 30,000 climbed the pass between the summer of 1897 and the spring of 1898. Several thousand others, looking up at the towering peaks, lost their nerve (or gained their senses) and returned to the States on the next southbound vessel. Still others lost their lives as avalanches roared down, covering them, their gear and pack animals.

In recent years, thousands of hikers have made the trek from the almost abandoned shack town of Dyea to the railway station at Lake Bennett, tracing the route of the stampeders and looting the Chilkoot Trail of belt buckles, pieces of dog harness, discarded overshoes, empty rifle cartridges and other historic souvenirs to take home for display in their living rooms. But only in summer.

Then, in 1973, four men decided to make the hike in winter. On February 19, Bob Frisch, Hans Algotsson, Paul von Baich and Dirk Tempelman-Kluit set out from Dyea with eight dogs, two sleds, 500 pounds of gear and 180 pounds of dogfood. On March 8 they arrived, intact, at Lake Bennett. The trip was slow and difficult—32 miles in 18 days—and provides a recent record of the journey taken at the same season it was taken by stampeders, 75 years earlier.

On February 19, the hikers' notes indicate, Dyea weather is a balmy 35 degrees above zero. The sky is gray, and a layer of Pacific mist conceals surrounding peaks. Drops of moisture hang from spruce trees along the trail. The slope is gradual and the dogs easily pull the 250-pound sleds.

For the first few miles, the trail snakes back and forth across the snow-covered Taiya River. The narrow, fast-moving river is unfrozen, and where there are no footbridges the men must wade it, carrying one sled at a time, with the icy water going into their boots. Wet snow lies on the ground, two feet deep. Frisch goes ahead, on snowshoes, breaking trail for the dogs. In the seven hours of daylight, the group makes only four miles before pitching their tent at 4:30, just before dark. They eat bannock and pea soup for supper, and dry their socks and boots on a line strung above the lightweight wood stove.

For stampeders during the winter of 1897-98, early going on the Chilkoot Trail was hampered as much by mass human confusion as by nature. Before the gold rush, Dyea was a quiet coastal settlement with 250 Chilkat Indian people and a single white trading post. By early winter of 1897, the place resembled a subarctic Woodstock, with 6,000 stampeders occupying

teams, push their heavily laden sleds up the strenuous slope of Long Hill.

Gold fields were still far ahead, down the Yukon. On Lake Bennett, men frenziedly built boats.

the tiny townsite, and another 2,000 clustered in campsites along the trail. Rough plank hotels and saloons were quickly thrown up and tent suburbs sprawled on the slope. Mounds of gear dotted the landscape—cast-iron stoves, pianos, sacks of flour, window glass, furniture, bales of hay, liquor, anything that was headed for Dawson. Theft was common. A motley collection of pack animals—dogs, horses, goats and cattle jostled along Dyea's muddy Trail Street.

Entering Dyea's harbor, new arrivals quickly learned that it was every man for himself. Their boat fare, they discovered, did not include safe dockside landing. To avoid grounding the passenger ships at low tide, gear was unloaded far out in the harbor, to be boated or rafted ashore at the stampeders' expense. Horses were backed out of the holds and swam. Lumber was tossed overboard. On the beach, teamsters charged $20 per hour (at low tide) and $50 an hour (rising tide) to haul gear to safety above waterline.

In neighboring Skagway, Soapy Smith charged homesick stampeders $5 for a 10-word cable, sent anywhere in the United States. But Smith's "telegraph office" lacked a telegraph set. He read the messages over each night, composed fake replies and charged for these—all strangely sent "collect"—at the same rate.

For the 1973 Chilkoot party, the warm overcast weather holds two more days. By February 22, still plodding through wet snow, they reach "Sheep Camp," just below timberline, 13 miles from tidewater and three miles from the Chilkoot Pass. During the winter of 1897-98, Sheep Camp was a transient tent-and-cabin city of 400, with a one-room hotel where each night stampeders slept head to foot on the floor of the smelly enclosure.

Today Sheep Camp consists of one log cabin in an open stand of aspens. The four men remain here two days, resting, mending harness and snowshoe bindings that the dogs have chewed up, washing socks, underwear and themselves.

Though little mentioned in gold-rush literature, the lack of sanitation and privacy imposed real pressures upon men and women who made the Chilkoot trip. Stuck in the cold wilderness environment, sharing it with crowds of other people, stampeders often did not bathe or change their clothing for a month. Washtubs and hot water were rare. There were few private places to bathe. People often refrained from using the nearby latrines and outhouses. They were cold—sometimes minus 30 degrees cold—and embarrassingly public. Prolonged periods of constipation were common.

Predictably, illness spread quickly. Within narrow frozen canyons leading up to Chilkoot Pass, all human wastes quickly drained into the Taiya River—and the river was the source of all cooking and drinking water. The most terrifying epidemic was one of spinal meningitis, which killed slowly and terribly. People also were killed or debilitated by typhoid, tuberculosis, frostbite and gunshot wounds.

The human response to illness, injury and death

Dyea in 1898 swarmed with stampeders' suppliers, packers, and the girls they left behind them.

was as demoralizing as the mishaps themselves. Stampeders' diaries contain accounts of the injured lying unaided as others filed by. Apparent suicides were not investigated. Several men who died on the trail were casually covered with snow, and their remains contributed to the peculiar effluent of the Taiya River. Formal burial, in the frozen earth, required more time and effort than most stampeders would donate.

On February 24, the four modern travelers on the old route leave Sheep Camp for the pass. The day is cold and windy. The white slopes gleam brightly in the sun. Soon the slope inclines at an angle of about 20 degrees, rising 1,800 feet in three miles of travel. The dogs have trouble with the sleds. The men join their two teams into one, heaping the gear onto one sled. Algotsson and Frisch hitch themselves into harness with the dogs. Slowly the group moves on, reaching The Scales—a small basin a half mile below the pass—by dark.

Sheep Camp marks the spot where pack animals lost their utility during the Chilkoot climb of 1897-98. Above the camp, where the slope steepens dramatically, dogs can pull little and packhorses can hardly walk. And whoever used them faced the added problem of hauling the animals' feed. Horses—many of which were old, sickly animals even before they were shipped north—were often killed or abandoned on this stretch of trail. Others, unpacked, were led closer to the pass, and were skidded on their sides up and over the snowy summit by men and winches.

Shortly after the gold rush began, the Canadian Northwest Mounted Police predicted—probably correctly—that mass starvation would occur within the Yukon unless each stampeder was equipped with a year's supply of grub upon entering the territory. According to the Mounties' calculations, one year's grub amounted to 1,150 pounds, mostly of flour, beans, lard, oatmeal, rice and bacon. At the pass, they erected a set of scales and refused entry into Canada to anyone who did not have the prescribed poundage. With the 1,150 pounds of food, plus whatever other equipment a man needed, the weight of a sourdough's gear and grub was more than a ton.

Some men could afford to hire Indian packers, or to use one of the three aerial tramways set up near the pass. But the average stampeder did not have the money. He carried loads of 100 pounds at a time, which, as any backpacker knows, is between two and three times the amount a 150-pound man can carry safely. And, unlike today's recreational climbers of the Chilkoot, he typically made 30 round trips over the trail, a distance of 1,900 miles, to get all of his gear from Dyea to the headwaters of the Yukon.

The four men spend the night of February 23 at The Scales, camped in the lee of a house-sized boulder. In the morning they awake to find the ceiling of the tent hanging close to their faces. They dig out. The tent, sleds and sled dogs are covered with a five-foot drift, and the snow is still falling. It is below zero; visibility is only 50 feet. With the wind factor, the effective temperature is 30 below. The men rub their noses and cheeks with wool pads sewn on the back of their mittens to prevent frostbite. After only a few minutes outside, their beards mat with wedges of ice. There is no use hiking today. They remain inside, waiting, pe-

At frozen Crater Lake on Dyea Trail, innovative gold seekers put sails on their sleds to facilitate crossing.

riodically clearing snow from the tent roof, bringing in the sled dogs—two by two—to warm up.

It was here, at The Scales, on the morning of April 3, 1898, that thousands of tons of snow thundered down on the tent town of gold rushers waiting to ascend the final slope to the pass. It was an inevitable event. A blizzard had added six feet of new snow to the flanks of surrounding peaks. In the warmth of midday the wall of snow came tumbling down, flattening tents, animals and men. Sixty-three bodies—some entombed in running position—were removed from the snow during following days. Other bodies were found, now and then, with the spring thaw. The tragedy caused only a minor delay in the mass migration over the pass.

The snow lasts all day and the men remain in the tent. They wait all day and into the night, but the snow comes harder, a blizzard. Every half hour someone goes out to scrape snow from the tent roof, but it accumulates faster than it can be removed. They prop up the roof with snowshoes and with the tripod from von Baich's camera. Before dark, Frisch conducts a halfhearted search for firewood, but there is none to be found. They melt snow on the butane stove to make tea, and feed the dogs. They wait for morning.

The stampeders were often slowed by the weather, and the frustrations were enormous. They had a place to reach and a deadline to meet. The Klondike gold fields, obviously, were limited. Whoever got there first would stake the richest claims. Pinned down by weather within their shelters on the Chilkoot Pass, stampeders were ever aware that thousands were ahead of them. Some, perhaps too many, were already in Dawson, sifting earth and gravel through sluice boxes, finding nuggets. Was it worth going on? Another four months and 600 miles? Were all the good claims staked?

No one knew. There were no newspapers, no telephones, no telegraph, between the Klondike and the Chilkoot. In winter, just a few travelers straggled through from the Yukon interior, and what they had heard of doings in the Klondike was at third or fourth hand. No one knew for sure.

In the morning the blizzard continues. With the delay caused by the storm, the group is now low on supplies. The last candle has been burned. Only eight pounds of the original 40 pounds of flour remain, only 30 pounds of the original 180 pounds of dog meal. Frisch recommends abandoning the project. Von Baich is neutral. Algotsson and Tempelman-Kluit argue for a return to Dyea and Skagway for more supplies, then another attempt to climb the pass. Their motion carries. The men pack up their food and sleeping bags, abandon the tent and nonessential gear, and beat a retreat to Sheep Camp. After a lunch of bannock and tea, three men continue to Dyea and Skagway with most of the remaining food. Von Baich has picked up a bug of some kind. He has a fever and his bones ache. He remains at Sheep Camp with the dogs, eating half rations, feeding himself and the animals a few heated spoonfuls of meal per day.

A slope too steep for the dogs

On March 2 his three partners return from Dyea and on the next day the group makes another attempt to reach the Chilkoot Pass. This time, to avoid the danger of avalanches while camping overnight at The Scales, they use Sheep Camp as their base, planning to transport a portion of their gear up to the pass today, the rest of it tomorrow, returning the three-mile distance to Sheep Camp at night. After rescuing their tent and gear from an eight-foot drift, they begin the step-by-step ascent. The dogs are used as far as The Scales. But above this they cannot pull even an empty sled. They repeatedly scramble and fall, and Algotsson takes them out of harness. The slope here is 30 degrees, rising 1,320 feet in the last half mile. Each man takes some of the gear from the sled. They use snowshoes in the waist-deep snow, but soon the slope becomes too steep for this. They remove the snowshoes and use them for walking sticks.

Again, a wind drives down from the pass, stinging the hikers' faces with snow. It is hard to breathe, and the climbers stop every hundred feet or so to rest.

Their beards freeze. They speak little, sparing their wind. Again and again they sprawl headlong in the powder, then fight to lift themselves and their 80-pound packs up out of the light, shifting snow. The dogs tangle among their feet. Frisch swats at them, loses his mitten and must chase a hundred feet as the wind catches and flings it down the slope. It takes him ten minutes to regain the ground he lost. Briefly, the thought comes that the truly pleasant thing would be to throw themselves down, permit the snow to cover them, and await the spring thaw. He attempts to convey this to his companions, but his cold-stiffened mouth cannot form the words. The group plods on.

The amount of strength and concentration needed to ascend the last stages of the climb seems almost superhuman. That was especially so for the old stampeders, when all one had to look forward to were dozens of repeat trips. Each morning, the three or four hundred men at The Scales queued up, following one another in a straight line up the 1,500 steps (the "Golden Stairs") that were cut into the icy slope by some of the thousands who trod it daily. Most of the men were already fatigued by previous weeks of hauling, by poor food, by sweat-stiffened clothing and cold nights. Methodically placing foot in front of foot, following the man ahead, they inched toward the crest.

One might imagine that the promise of a fortune in gold could inspire them. Yet the promise was hazy, shrouded in speculation, accompanied by the strong possibility of loss of life or limb. The truly sensible stampeders were those who turned back after observing the hardships of the trail.

On March 4, the four men and eight dogs make their final haul of gear up to the summit of the pass. But there is no time to celebrate. It has begun to snow again and visibility is only 20 feet. The small notch of the pass serves as a wind funnel and the men find it hard to stand erect. With only an hour and a half of daylight remaining, they again lash the gear to the sleds, urge the dogs onward, and stumble down into Canada, struggling in the poor light to stay on the trail. At dark, they camp above timberline, about two miles down from the pass. They've made it. It is another three days and 14 miles to the railway station at Lake Bennett, but these are downhill miles. The real danger and challenge are behind. With a tired satisfaction, they feed the dogs, cook a pot of tea and drop off.

For the stampeders, too, there was undoubtedly a satisfaction in finally topping the Chilkoot with the last load of gear and finding themselves on the final stretch of the overland route, nearing the Yukon headwaters. But victory over Chilkoot Pass by no means marked the end of their ordeal. They had still to cut timber and build boats to float downstream. They had still to shoot the Whitehorse Rapids 60 miles downriver, where hundreds of craft would be lost. Worst of all, they had simply to wait, all winter, until the breakup on May 17, before they could put into the water and be under way to Dawson. Throughout the winter of 1897-98, thousands waited in their tents along the shores of Lake Bennett and Lake Lindeman, suffering the same cold and dirt, the same monotony, the same lack of privacy and good food and medical attention that they had already endured for two to three months. If you cut your foot with an ax, you were in trouble. If a tooth began to decay and ache, it would continue to decay and ache until someone pulled it with pliers.

And what none of them knew was that the Klondike gold rush, even then, was essentially over. Months before word of gold reached the outside world, it had reached prospectors who were already at work in northern Canada and Alaska, near the Klondike. These men, and the first few arrivals from the outside, by now had staked and claimed every inch of the Klondike's major gold creeks. The influx of people into the Yukon continued through 1898 and into 1899, but the last significant gold find—the kind that made a man wealthy—was made in October 1897.

A handful of those who climbed the Chilkoot in the winter of 1897-98 and who arrived in Dawson early the next summer did make respectable livings from gold—by scouting farther, working harder, and devoting more years to the raw frozen north. But most returned home with less money in their pockets than when they came. For 99 out of 100, the privation, the risks, the struggle to conquer the Chilkoot Trail turned out to be little more than an exercise in futility.

Nature scores. In a storm, modern party retreated to await later, successful attack on the pass.

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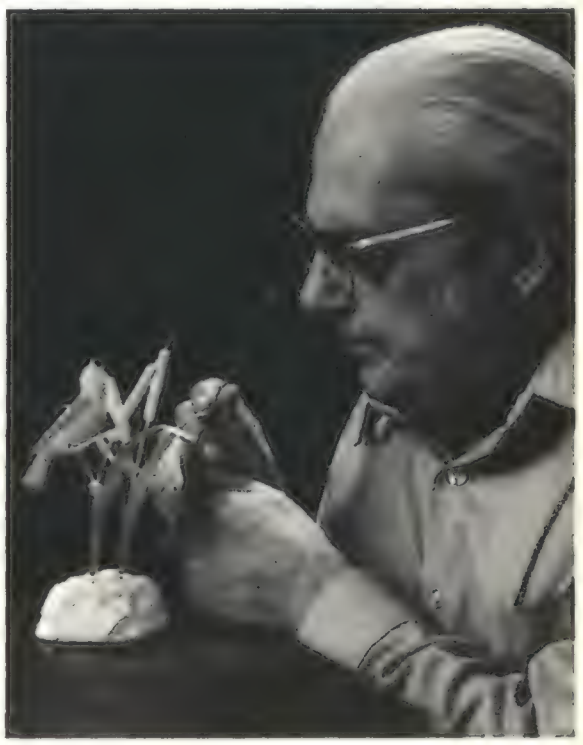

Baltimore Orioles—Shown actual size. The sculpture portrays a female Oriole and her young in a family grouping characteristic of this very domestic bird.

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By Michael Kernan

Breathing life into dry bones

Studying ethnics, identifying murder victims, digging up classical sites—they're routine to Smithsonian Bone Man

To the layman this skeleton may say nothing, but to Dr. Lawrence Angel it may tell the story of a life.

Pretty Evelyn Nasca was last seen alive at a talent show held at her high school in Rockville, Maryland, the night of January 26, 1973. The bright 17-year-old senior walked off sometime during the evening without even putting her coat on, her date said. There were no clues. Nearly two years later a neighbor found a human skull in a wooded area behind the suburban Montgomery County school. Naturally, the police wondered if it could be Evelyn's and where the rest of the skeleton might be. Almost as a reflex, the skull was given to Dr. John Lawrence Angel, curator of physical anthropology at the Smithsonian Institution, known to law enforcement people all around the country as the Bone Man.

"They brought me the skull, without any jaw, and the girl's picture," Dr. Angel said in a recent interview. "I pointed out that skulls roll, once they get separated from the skeleton, so they followed that up and put 40 police recruits and volunteers out there and after a day's search they found the bones all but buried in a thicket at the top of a little hill." The searchers found other things, too: a pair of rusty scissors, and a shirt and bra with holes in them. The ribs showed cut marks.

Nameless victim identified from teeth

"It was obviously an adolescent—excuse me, a subadult," said Angel, precise as always. "The skull had molars, but the third molars weren't fully in. The sex wasn't easy. It had enough brow ridge to be either sex. At this age males haven't really developed their heavy brow ridges and females are a little bit ahead. But judging from the delicate lines, I said it was probably female." He and the medical examiners had some doubts that the slash marks were made by the scissors. He began studying snapshots of the girl. He drew sketches of her probable facial contours based on the skull, though this is still a fairly chancy technique. The general shape of the cranium seemed right for Evelyn's German-Sicilian background; it's something you get a feel for after 40 years of handling bones.

The thing that did it was a smiling picture of Evelyn taken shortly before her death, a picture that Dr. Angel studied carefully. Two of the front teeth were out of line just a tiny bit. And so were the front teeth of the skull. No one was ever arrested for the murder of Evelyn Nasca, since the presumed suspect—arrested in a similar case—committed suicide.

"Our people swear by Larry Angel," commented Major Wayne Brown, director of the criminal investigation division of Montgomery County police. "I've never dealt with him personally, but he's a good man to know." Lacking a staff physical anthropologist, the FBI uses his services regularly. This means that every unidentified skeleton around the country over

which the FBI has jurisdiction is likely to wind up on Angel's workbench. The assistant director of the FBI laboratory in Washington, Jay Cochrane jr., says his work has been "of inestimable value."

Cases come in every few days. Since he has to spend a day or more on each one, he feels swamped sometimes, for this is by no means his main occupation. Almost from the time he was born in 1915, Lawrence Angel was headed for a career in classical archaeology. It was a family tradition: his mother was a classics scholar, and her father was a professor of Greek at Yale and a founder of the American School of Classical Studies in Athens. Born in London (his English father was a sculptor), Angel came to America in 1928, sped through Choate School and entered Harvard.

Then the Angels' house burned down. "The family took their insurance money and went to Europe," he said, "but I took mine and used it to go to the University of New Mexico's field school near Jemez. Clyde Kluckhohn converted me from classics to anthropology. His work with Indian remains turned me on." It is the anthropologist, as Angel is fond of saying, who gives skeletons a voice, whether they cry out for justice or help us resurrect the human past. One begins with the sex and age of the vanished person. Milk teeth are a great help, for boys usually are ahead in this area while girls are first to get permanent ones. There are tooth eruption charts which pinpoint probable sex and age right down to the month.

Another good place to look is in the skull sutures, those jagged crevices in the bone which gradually close following a developmental process well-known to medical men. Skull sutures and teeth are among the best means of judging the age of Egyptian mummies, though specialists now find that the pubic symphysis and the epiphyses (typically, the fusing of the ends of long arm and leg bones as they finish their growth) are more reliable. Angel carries with him on field trips a three-by-five vade mecum containing the essential indices of growth and key bone changes. But some changes are contingent upon circumstances, for example, the "remodeling" of adult bone, which alters its shape under stress, building extra layers where pressure is greatest. This process can be measured by studying cross sections of the bone in question.

Once, working only from part of a skull and some long bones with the ends eaten off, Angel correctly identified them as belonging to two girls, aged about 9 and 11, robust girls who lived outdoors a great deal. As it turned out, they were from Montana, where almost everyone rides horseback as a matter of course.

A reporter for The Washington Post, *Michael Kernan often writes on American life-styles. His story about rocketry appeared in* SMITHSONIAN, *March 1976.*

Evelyn Nasca's teeth look perfect, but under Angel's painstaking scrutiny misalignments were detected matching those in skull below. This is his only positive identification based solely on a photograph.

Nasca spine, fractured in dancing or other exercise (circle), would have meant back pain.

Hands of female Micronesian net weaver, left, and masseuse, right, evince occupational bone stresses.

Over the years, even riding can produce stresses that will cause a buildup of bone tissue.

This aspect fascinates Angel, because it could open the past to us in ways we have never thought possible. What if we could deduce, for example, the occupation of a person dead 3,000 years? Learn from characteristic bone shape whether he was a hunter, a farmer or a scribe, whether he used a bow or a carpenter's plane, whether he dug ditches or did a lot of writing? Such analyses could make an enormous difference in setting the anthropological record straight, and even in clarifying obscure incidents in history.

A monograph Angel has written, built around an anthropometric chart, correlates such things as longevity, fertility, juvenile death rate, stature and tooth decay through 16 cultural periods from 30,000 B.C. to the United States of 1960. With figures derived from measurement of thousands of skeletons, the chart details some fascinating trends through the ages: lives grew shorter during the chaotic early Iron Age around 1200 B.C., but stature rose a little at the same time, later dropping "probably for nutritional reasons." Then, abruptly, population virtually doubled during "the creative leap of Classical times," people began living up to six years longer on average, child mortality dropped, "the pelvis deepens and stature rises three to four centimeters, in step with the addition of eggs, meat and fish to the diet. Added protein is the plausible cause for much better dental health. Ethnic mixing produced individuals with greater physical and cultural vitality."

Pubic bones reveal age changes

The story of the fall of Rome lies hidden among these modest columns of numbers, reflected in misuse of the soil, a resurgence of malaria, perhaps the effect of lead poisoning from the city's water pipes. In the same way, one can trace the effects of pollution and technology on our lives in recent years.

One should not, however, get the idea that all this comes easily. There are striking differences between one human skeleton and another. No two people develop at the same rate. "We all have female friends with male brows," Angel noted, "or even the narrow pelvis of the male. And vice versa. We all know people who at 75 are as mobile as others 30 years younger."

Even in casual conversation Dr. Angel slips from one scientific discipline to another in his efforts to describe his work. Explaining how it is possible to tell the number of children a woman has had from scars on the pubic bone, he soon becomes involved in a fairly technical discussion of childbirth. Then he veers into comparative anatomy, to medicine and back to history. And then back to his never-flagging concern with the

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From left: human, chimp and bear feet. Laymen commonly mistake bear foot bones for human ones.

Magothy River dig, Maryland, unearthed upper jaw, mandible of black female who died around 1750.

Cross sections of pubic bones show ridges and furrows which build up, break down over lifetime.

age and sex of skeletons. "The area where the two pubic bones come together, above the genitals, is the best single area for age changes and also one of the best for determining sex."

It takes a restless and obviously energetic person to keep abreast of so many related sciences. Dr. Angel is a bit offhand about it. From 1943 to 1962, when he taught anatomy and physical anthropology at Jefferson Medical College in Philadelphia (via Harvard, Berkeley and Minnesota), he found that after the first year or two, "when you don't know much more than the students do," teaching anatomy begins to pale a little. However, instead of retreating from contact with students, Angel got into the habit of delving into varied problems ranging from obesity and hypertension to studies of the joints. For several years he consulted in surgical anatomy at the U.S. Naval Hospital in Philadelphia, going over the tiniest details of head and neck structure with young Navy surgeons, who need every scrap of information they can get before poking a knife into, say, the inner ear.

In 1962 he came to the Smithsonian, filling in his spare time with teaching stints at George Washington, Howard and Johns Hopkins Universities, more or less simultaneously. And when he wasn't lecturing, he was advising the National Science Foundation, or writing books on Troy and the preclassical Aegean site of Lerna. And then there was his family: he and his wife Peggy, whom he married in 1937, have three grown children. She occasionally accompanies him on one of his field trips to the Mediterranean.

Dr. Angel's major lifelong interest has been demography, both ancient and modern populations. Recently he has done work on the Terry Collection, skeletons of people from St. Louis, Missouri, black and white, male and female.

One gets a sharp sense of the man's dervishlike en-

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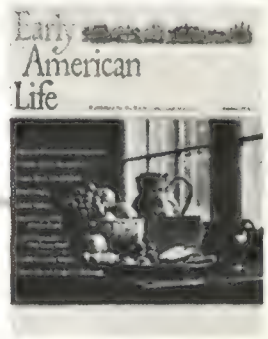

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ergy and encyclopedic interests just in scanning his office. A dusty cubicle tucked away up in the Smithsonian's Museum of Natural History, amidst a warren of corridors jammed with mummy cases, Greek water jars and Indian busts, between endless columns of storage drawers full of bones, this office is a literary haystack of books and papers (all meticulously arranged and labeled, one hastens to add), bursting file cabinets, small mountains of slides, ethnic photographs, charts, family snapshots and—the perfect metaphor for his work—a rather spectacular nude formed by an arrangement of numbers and symbols on a sheet of computer paper.

If one enters the room with a jocular comment about the "nation's attic," Dr. Angel whirls, blue eyes snapping: "I'm going to slug the next person who says that! I'm tired of that phrase!" A moment later, balling up some scraps of paper, he excused himself and stepped out into the corridor. He had to keep his wastebasket out there, he explained. There wasn't room for it in the office. His time was limited. His last visitor had been an FBI man. He talked fast, riposting, eyes bright with the joy of combat.

"Do you like the forensic work?"

"Yes, but I'd rather be working on ancient material, on the multitude of factors that are apt to interfere with or promote the advance of civilization. It's variety that is stimulating."

"Do you ever go to the scene of a crime?"

"No! Takes too much time."

"How about the police? Have you trained them to bring in the bones the way they were found or anything like that?"

"No! Usually they just come in a bag or box, packed in newspapers or plastic. But when I do seminars for forensic pathologists, I try to include law enforcement people, because then I can impress upon them how I want every single scrap of evidence that can be brought in. This has all been emphasized in an FBI bulletin that gets reissued every month."

Frequently, Angel corrects his statements to express exactly what he has in mind. Precision. It is a central fact about his whole life. Maybe the best proof of what this man's precision can accomplish is the infamous Coeur d'Alene case. There are, to be sure, hundreds of others to choose from, the foot bone in a safety boot that was fished out of the Tennessee River, the pitiful little handful of teeth and fingerbones retrieved from an Illinois trash can where a child's body had been burned, the innumerable floaters and buried remains and victims of swamp or cliff or desert thirst. But the Coeur d'Alene case will do.

Skulls from two late Bronze-age family tombs under Athenian agora. Middle specimen, top, is probably an in-law. Conformation of crania establishes that repeated ethnic blending produced Greek people.

A bundle of bones was found near that Idaho city. Some were animal, a few human. The latter were assumed to be the remains of a woman named Rita M., missing for seven months. The obvious suspect was her husband Ron, who had vanished about the same time. The bones were sent to Angel. They were in bad shape, having been gnawed by coyotes. Many consisted merely of shafts, lacking both ends, and they represented only part of the woman's body. As Angel sorted, examined and measured, he made an odd discovery. One bone didn't seem to fit. It was a piece of fibula, the thin outer bone of the lower leg. Neither end was intact; it was no more than a sliver.

"All the other pieces," he said, "could be interpreted as being those of a fairly robust and young 20-year-old or so female, probably white, as far as one could guess from body proportions. And then there was this fibula that could just possibly be female. It was at the upper end of the female range in size, but it was too long for her stature." Could it have been a man's? Could it have been Ron M.'s? Could the husband have been, not the culprit, but a fellow victim?

By then a new suspect had been captured, a man who owned a truck that was found to contain traces of blood mostly scoured away by gasoline. This would fit in with a theory that the body or bodies had been cut up and deposited in bundles around the countryside. At length the suspect came to trial. Naturally, the defense argued that the fatal fibula belonged to Rita. After all, the clothes found with the bones belonged to her. None of Ron's effects had been found, nor did any more of his bones turn up, though the woman's skull eventually was brought in from another location.

Then Lawrence Angel produced a set of complex graphs based on comparative bone lengths and widths. He showed that it was all but impossible for the fibula to have belonged to a woman of normal height. Calculations indicated instead a man of more than six feet, probably about six feet two. But Ron M. had stood 6 feet 4.

"I asked if there had been some peculiarity about his body build. We found enough photos and other evidence to suggest that a lot of his stature was in the trunk of his body. Finally, there was his childhood nickname, 'Droopy Drawers.' That clinched it."

The suspect was found not guilty and the case trailed off. Yet one day, perhaps, someone will find another cache of human bones in the wilderness around Coeur d'Alene. And they will call him again, the Bone Man, with his calipers and charts and darting mind. He rather expects it.

Dr. Angel examines a collection of Egyptian skulls. His recurrent nightmare: small boy breaks away from inattentive parents, wanders into the area and arbitrarily rearranges contents of some 500 drawers.

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A self-portrait in watercolor by Walter Inglis Anderson, another aspect of his art.

In watercolor and painting Anderson sought a unifying color; in drawings, a spare and swift line.

By Redding S. Sugg jr.

Southern gentleman and Pope's Homer

In his deep Mississippi 19th-century plantation house, a reclusive aristocrat devoted years to making 1,750 drawings illustrating heroic verse

Among the cherished, though perhaps somewhat apocryphal, scenes from American social history are Southern gentlemen of the 18th and 19th centuries perusing the couplets of Alexander Pope in the libraries of plantation houses from Virginia to Texas. To discover one in the 20th century who not only read, but was so graphic-minded that he transposed the grandest neoclassical work of them all, Pope's translation of the *Iliad*, into 1,750 line drawings, is to enjoy an experience comparable to what an ornithologist might feel on recognizing in his cote a surviving passenger pigeon.

Our 20th-century Pope scholar was Walter Inglis Anderson, who to his taste for heroic verse joined a brilliant, professionally trained talent as a draftsman. He read and illustrated his Pope at "Oldfields," a plantation on the Mississippi coast near the village of Gautier, which was the property of his father-in-law, a retired Pittsburgh lawyer of a Louisville family who had bought it as a summer place. Oldfields, built in 1847, is one of the best examples of the simple, unpretentious West Indies style, white clapboard and green shutters with gabled roof extending to cover a deep front gallery, 85 feet across. The roof above is punctuated by four dormers looking seaward, in the attic behind which Walter Anderson had his studio from 1940 through 1946.

A free-lance writer and editor, the author's work on Anderson's illustrations has been supported by a grant from the American Council of Learned Societies.

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The Pope illustrations were drawn, however, not in his studio but at the banquet table, where he sat night after night absorbing and translating into graphics the heroic text.

It was an extraordinary process. He sat midway at the long table, the book at his left and a stack of typewriter second sheets at his right hand. His eyes fixed on the printed page, his pen produced, as if unsupervised, outline sketches of an astonishingly large proportion of the visual passages, including not only directly presented scenes but mental events—such as the memories and dreams of characters, and similes. The drawings accumulated steadily to his right, to be nudged out of the way across the polished surface of the table, slipping, from time to time, off onto the floor where he was content to leave them. He occasionally helped his wife collect them in the morning for storage.

Anderson's absorption in this process sometimes would hold till dawn. In the dining room, at one end of the big house, he was at a considerable distance from the family, whose interruptions he did not welcome. His wife would provide a pot of coffee. He liked to draw or paint to music—either his own singing, in what is reported to have been a fine baritone,

Anderson's watercolor sketch of the house at Oldfields.

or phonograph records. If, thinking he was overdoing it, his wife looked in on him in the small hours, she was likely to find him feeding large oak-tree cockroaches from his coffee spoon. He called them his familiars, and if they offended housekeeping sensibilities, that was of little interest to him.

I have presented Walter Anderson under the type of *the* Southern gentleman, but it will be apparent that he was a peculiar instance of the species. The transposition of text to graphics was not limited to the *Iliad;* and, though a well-trained artist, Anderson was not drawing for any market and never regarded his drawings as finished work for public consumption. The texts he illustrated were all, in one sense or another, epic.

He illustrated *Ossian* (which had had its day in Southern plantation houses, too, but which may have been on Anderson's shelves as a memento of a Scottish great-grandfather who was mayor of Glasgow, Member of Parliament and a poet). He illustrated, further, *The Legends of Charlemagne, The Divine Comedy, Don Quixote, Samson Agonistes, Paradise Lost, Paradise Regained, Faust, The Rime of the Ancient Mariner,* Darwin's *Beagle* and *Alice in Wonderland.* His appetite

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extended, indeed, to other texts as well; some illustrations remain which have not been identified and some may have been destroyed. He is known to have been familiar with Hakluyt and Humboldt, for example, and wrote verse about Leif Ericson and Columbus, all themes which he might conceivably have illustrated. The total of the surviving illustrations comes to nearly 10,000.

This trove should be understood as a small and, by him, largely unregarded part of all that he produced, the extent of which has been gradually appreciated only since his death in 1965 at the age of 62. The half-dozen years at Oldfields, when the rage for illustrating was upon him, were an interim between hospitalization for severe mental illness from 1937 to 1940 and an 18-year period of seclusion, beginning at the end of 1946 and lasting until he died. Nobody who knew him doubted his talent, but to most appearances it was ruined and aborted. He lived by himself in a cottage on his family's property facing the Mississippi Sound at Ocean Springs, Mississippi, earning a pittance for his keep by designing pottery (now sought by collectors) for his brother Peter's Shearwater Pottery and spending as much as half his time alone on the deserted islands of the Sound.

An artist and "decorator"

Born at New Orleans in 1903, Anderson was educated at St. John's School in Manlius, New York, the fine old Manual Training School in New Orleans (in the development of which one of his forebears was prominent), for a year at what is now the Parsons School of Design in New York, and finally the Pennsylvania Academy of the Fine Arts. He was graduated with prizes from the latter in 1928 and went to France for a year on a Cresson Award before settling in Ocean Springs, where his family had retired.

There he started a sufficiently promising career, although along principles not very conducive to recognition as a painter. He took himself seriously as an artist but insisted on giving his occupation when queried, or on his passport, as "decorator." In that capacity he meant to earn his living and was willing to devote up to half his time to it, in return for which he believed society owed him the other half for painting. As decorator he regarded himself as leavening popular

Agamemnon Lauds Teucer

Who first by Teucer's *mortal Arrows bled?*

Heaps fell on Heaps, sad Trophies of his Art,
A Trojan *Ghost attending ev'ry Dart.*
Great Agamemnon *views with joyful Eye*
The Ranks grow thinner as his Arrows fly,
Oh Youth for ever dear! (the Monarch cry'd)
Thus, always thus, thy early Worth he try'd.

An Instance of Pernicious Ire

The silver Cynthia *bade* Contention *rise,*
In Vengeance of neglected Sacrifice;
On Oeneus' *Fields she sent a monstrous Boar,*
That levell'd Harvests, and whole Forests tore:
This Beast (when many a Chief his Tusks had slain)
Great Meleager *stretch'd along the Plain.*
Then, for his Spoils, a new Debate arose,
The Neighbour Nations thence commencing Foes.

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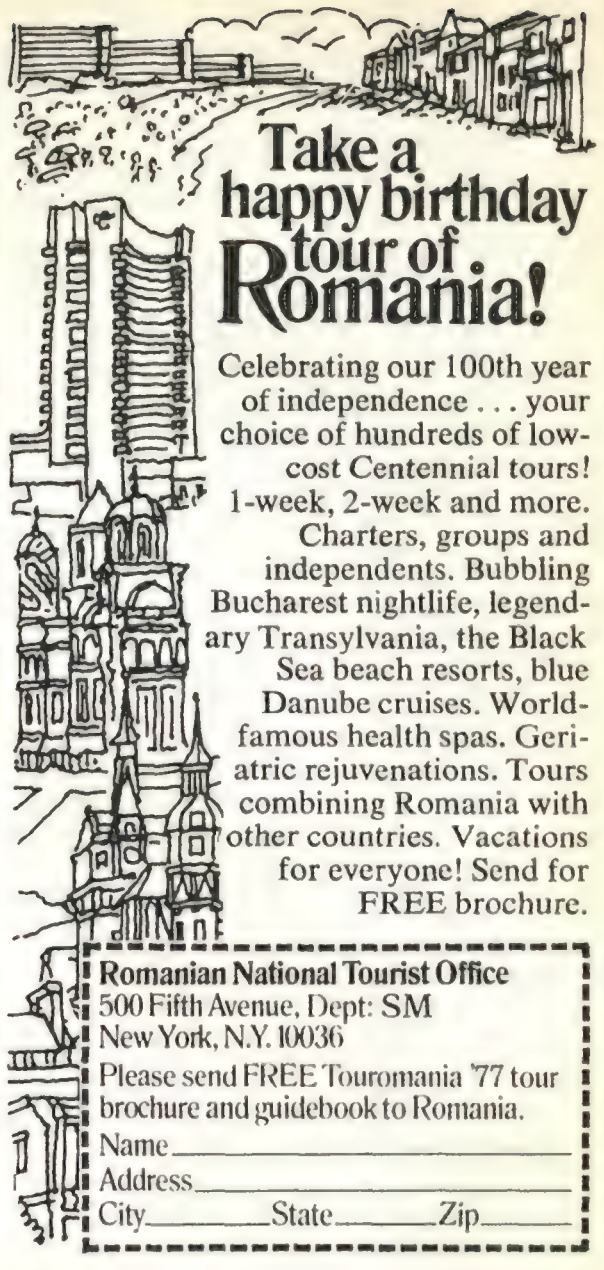

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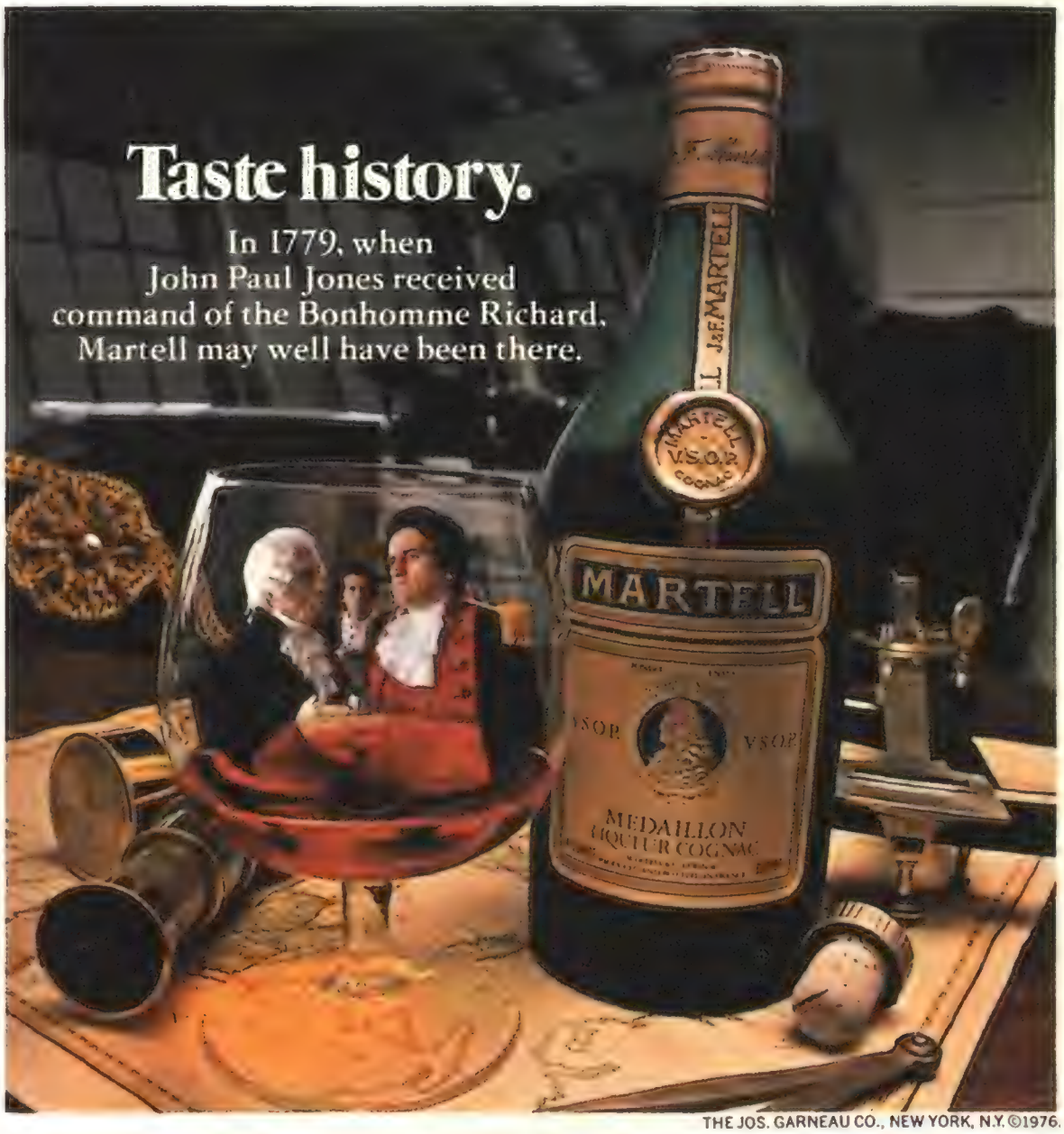

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taste by producing pottery and linoleum block prints at moderate prices. He started to get commissions for murals in public buildings from the WPA under the New Deal. He married, had children and, until his breakdown in 1937, seemed stable in his career.

The illustrations that he drew at Oldfields after being released from mental institutions might be taken as an instance of his work as a "decorator," but that would be wrong. They appear rather to represent a phase of his readjustment after mental illness. We infer as much from logs that he kept of his frequent extended sojourns on his islands. While illustrating at Oldfields, he withdrew further and further from family and social life and established the idiosyncratic patterns that were permanent after he finally left the plantation.

Regarded as hopelessly schizophrenic, he was left, in the context of a supportive family community, to his own devices. From the island logs and others that he kept of bicycle trips, which were discovered when he died, it appears that he stuck to his original program, half-time decorator, half-time painter, decorator onshore, painter offshore. "So much depends," he wrote, "on the dominant mode on shore, that it was necessary for me to go to sea to find the conditional." Onshore, he decorated ten pots a week for the Shearwater Pottery. Offshore, he became in time what he called a "dramatic" painter.

An island stage for a human role

The illustrations for the *Iliad* and the other texts were part of his development of "dramatic" painting. The "conditional" that he voyaged to find was equivalent to the conditions of irresponsibility his eccentricity required. In a larger sense the conditional was nothing less than the concept of nature. The nonhuman life of the islands was the scene of his drama, and he tried out, successfully he came to believe, for a human role in due relationship to every other.

On his island stage (where his life was full of hardship and often dangerous) he drew and painted the birds, animals, insects, sea creatures, plants and panoramas. Some 5,000 works in each medium were found in his cottage after he died. It is likely many others perished. He had the impulse to store 2,000 of the watercolors

Stalemate

Great Jove *from* Ide *with Slaughter fills his Sight,*
And level hangs the doubtful Scale of Fight.

Hecamede Pours The Potion

The Draught prescrib'd, fair Hecamede *Prepares,*
Arsinous' *Daughter, grac'd with golden Hairs. . . .*
. . . her white Hand an antique Goblet brings. . . .
. . . the Nymph of Form divine
Pours a large Potion of the Pramnian Wine. . . .

Agamede

. . . Agamede:
(She that all Simple's healing Virtues knew,
And ev'ry Herb that drinks the Morning Dew.)

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in a small chest, while taking no special care to preserve the rest.

In drawing the figures in each text he illustrated, he devised a special cartoon-like convention—that for the *Iliad* evidently alluding to the line drawings on ancient Greek vases, and perhaps also (given his work in block prints) to the block print illustrations of the earliest printed books. The human figures for the *Iliad* are scarcely differentiated within each sex except by attitude, characteristics of age or costume. The gods, however, are given distinguishing attributes; Neptune looks like a merman; Jupiter is presented with his bird and his thunder, and Vulcan gimpy-legged at his forge.

There is a good deal of humor in Anderson's illustrations, although he responded appropriately to grand, lyrical or pathetic passages as well. His logs suggest that it was in part reflexive humor, for Anderson was often wry about the eccentric extremes to which he often voyaged, and was obviously impressed by the excesses of the Greeks and Trojans in their stabbing, hacking, spearing, bludgeoning, trampling and crushing.

The Iliad *as cartoon*

But the humor of these drawings derives also from their resemblance to comic strips, editorial cartoons and animated films. His illustrations seem to anticipate some of the feeling of pop art and the vogue for satirical or parodistic comic strip, "two-dimensional" characterizations in American fiction since the 1960s. It is as cartoons in the senses suggested, rather than as the cartoon preparatory for painting, that Anderson's illustrations seem most original. They are so numerous, their incidence in the text so frequent, that they come astonishingly close to transposing the whole vast poem into the cartoon medium. If reproduced like the blocks in comic strips or placed on film as an animated cartoon, Anderson's abundant illustrations for any of a dozen books of the *Iliad* would make a striking effect.

The illustrations are, and in the end probably must be, accepted as intensely personal documents, to which formal criticism may not be relevant. From the Renaissance on, critics have appreciated the casual sketch as a direct expression of inspiration, and to this category Anderson's illustrations may be assigned.

The Greek Infantry Advance

The Foot, with those who wield
The lighter Arms, rush'd forward to the Field.

Asius Accuses Heaven

With Shame repuls'd, with Grief and Fury driv'n,
The frantic Asius *thus accuses Heav'n.*
In Pow'rs immortal who shall now believe?
Can those too flatter, and can Jove *deceive?*

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Photographs and text
by J. Linsley Gressitt

Symbiosis runs wild on the backs of high-living weevils

Predators, prey and scavengers all find what they need in a 'forest' of truly Lilliputian proportions

This is the stage for an ecological play that few see. It is the back, partly covered with lichens, of adult weevil *Gymnopholus lichenifer* Gressitt.

In the cool and humid moss forests of the Papuan highlands, an extraordinary example of symbiosis was recently discovered. The familiar doggerel "Big fleas have little fleas . . . ad infinitum" doesn't come close to describing the complexity of life found on the backs of certain weevils on the island of New Guinea.

The weevils feed on plants, all the while supporting on their own backs an ecological microcosm. Their saddlelike plant community harbors scavengers, commensals, predators and parasites, all of which interact with each other, maintaining nature's balance in a tiny world within a world. Plants from at least 13 different families are involved. Four phyla of animals feed on those plants, each other, or on the host weevil. All this occurs on the backs of weevils three-quarters of an inch to no more than an inch-and-a-half long.

The plants include algae, diatoms, fungi, lichens, liverworts and a moss. A minute developing fern was found on at least one weevil. The plants start growing in body depressions or on hair patches, but eventually may cover the entire upper surface, including the upper parts of the legs. The growth is more conspicuous when lichens are mature. The weevil may be nearly covered, the lichens even extending out over the side, which tends to confuse the viewer. The plants growing on the weevils are not restricted to them, but are among the species growing on surrounding objects such as leaves, bark or rocks.

The animals, of course, are small. There are various protozoa (one-celled animals), which may be purely scavengers. Rotifers are frequently abundant. These are minute animals, barely visible with a hand lens, which are essentially aquatic and can feed only when wet. They have funnels, rings or spiral structures bearing hairlike cilia which wave synchronously and wash minute food particles into the mouth. When the garden atop the weevil's back is dry, the rotifers dry out and shrink, turning pink; but when wet, they swell up and become active, appearing clear and colorless. With dew, rain or dense fog common in the Papuan upland environment, the rotifers can be quite active.

Occasionally bark lice are found on the weevils, presumably attracted from their tree-bark habitat by the presence of plants on which they normally feed.

Several types of mites occur on the weevils. One type preys on either the minute animals or feeds on some of the plants. Another type, bright red mites of the genus *Leptus*, are parasites, sucking

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Another weevil, *Pantorhytes lichenifer* Gressitt, shows similar lichen growth.

the weevils' internal fluids right through the heavy exoskeletons.

Perhaps the most interesting members of this complex association are the oval, eyeless oribatid mites, about a hundredth of an inch long, usually quite abundant on the weevils. These represent, as far as is known, a family found only on these weevils. This exclusivity, plus the diverse modifications on the weevils' body structures to foster and protect plants, appears to be evidence of true symbiosis.

The term symbiosis actually covers many different levels of ecological relationships, but generally implies a distinct interdependence of two quite different living organisms. In any one example, both parties may be plants, both may be animals, or there may be one of each. Note that the emphasis here is on "two" and "both"—a one-to-one relationship.

In the broader definition, there may be obvious benefit to one party in the relationship, but the benefit to the other party may be obscure, or there may be neither benefit nor harm. Some of these relationships border on parasitism, where one organism appears to have all the advantage while the other is harmed, as with barnacles on whales or fleas on dogs.

A more general term frequently used

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is "mutualism." This implies a still broader spectrum of relationships, where there may be a somewhat casual exchange of good turns. In that context, symbiosis may be more strictly applied to relationships that are obligatory in some sense: one partner being unable to live without the other, or each depending heavily upon the other, such as the oribatid mites and the weevils.

In the marine environment there are untold examples of symbiosis. To mention a few: small fish or crustaceans which remove and eat parasitic crustaceans or mollusks from the bodies of larger fish, other animals or plants (food in exchange for service). Or, sea anemones attached to the carapaces of large crabs or mollusk shells, getting free rides, scavenging wastes and offering camouflage or protection.

In the terrestrial realm examples may be less conspicuous, but many are fascinating. Both ants and termites have many guests—often beetles—in their nests.

Gressitt works for the Bishop Museum in Hawaii but is also director of the Wau Institute in Papua New Guinea.

Here a moth larva at right center is covered with bright yellow algae.

Some are simply scavenging helpers, cleaning the floor; but many are fed by the hosts in exchange for valuable secretions. Their larvae may be street-sweepers (mutualists), beggars (commensals), thieves (parasites), or even murderers (parasitoids or predators), but they are more or less tolerated and sometimes even fostered because of their secretions.

Mutualism is even more visible in the plant world. Many plants just live on the surfaces of other plants, a relationship known as epiphytism. Anyone who has been in tropical forests is familiar with these epiphytes. "Spanish moss" (a bromeliad) is one example. In tropical America epiphytic bromeliads, orchids and cacti are conspicuous, and in the Old World tropics, orchids, ferns, lilies, lichens, mosses, shrubs, vines and many others make up fantastic communities, especially in the moss- or cloud-forest zones. These relationships are not all symbiotic, but may involve parasitism or be essentially neutral.

Epizoic symbiosis applies to relationships on the outer surfaces of living animals. In most cases animals or plants living inside the bodies of living animals involve parasites or parasitoids (the latter kill their hosts, whereas parasites, usually, do not). Epizoism is the animal-world analogue of epiphytism.

Freshwater turtles in the Orient with long trailing algae growing on their backs have been known for centuries, and appear in Chinese and Japanese art

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and mythology. This may not be strict symbiosis, but it is some sort of mutualism. A classic case is the growth of algae on the fur of tree-living sloths in Central and South America.

Fungi have been found growing on certain weevils in moss-forest zones in the Andes and on Mount Kilimanjaro, but there is almost nothing in print on this subject. Lichens were found growing on the carapaces of living giant tortoises in the Galápagos a few years ago. Likewise in the 1960s, an alga was found growing on the upper surfaces, including the legs, of a bark-frequenting spider in Queensland, Australia. The same alga grows on the tree where the spider was found. The alga clearly augmented the natural resemblance of the spider to the bark surface on which it was living, making it difficult to see. I believe camouflage also explains the New Guinea weevils.

In recent years caterpillars of several different families of moths have been found at Wau Ecology Institute in Papua New Guinea with algae covering their bodies. Since the young larvae also have the algae, it is assumed that the larvae attach the algae to their backs for protective purposes. In each case the larvae feed on the same algae on the bark of trees and thus are remarkably camouflaged. Different species of algae of different colors are involved, but in each case the larva has on its back the same algae as are on the bark where it lives.

This adult mite represents one type of animal life found on the weevils' backs.

Finally, we come to the remarkable weevils under discussion, 30 or more species of the genus *Gymnopholus* plus members of two other weevil groups. All adults are leaf eaters.

Perhaps the most important thing about the weevils is their outer surface, so well adapted as a stratum for the growth of plants. Newly emerged adult weevils may have numerous scales, often metallic-appearing, which are unusual in form. Some of them are flat at the base like most scales, but then turn upward at right angles and taper to a point, resembling an erect flattened hair or spine. Other species have highly modified hairs, some branched like trees and others forming rosettes with a central spike or peg. All of these modified structures occur between tubercles in special pits, depressions or grooves, or along the edges of these structures—it is at these points that epizoic plants attach themselves.

The members of *Gymnopholus* which occur at lower altitudes, and do not have the plant growth, have normal flat scales or no scales or hairs. They thus may be entirely smooth above, without the pits and depressions, though sometimes with

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one or two pairs of tubercles. Even with the weevils' highly modified bodies, the ecological microworld on their backs is possible only because of a long evolutionary process in a specially favorable environment. Most of New Guinea is extremely humid and has no dry season. Plenty of moisture, shade and fog are requirements for this association. Also, it is unlikely that the symbiosis would have developed were the weevils not flightless, sedentary and very long-lived. Lichens are the dominant end point of this case of epizoic plant growth, and it takes time for lichens to develop.

At the Wau Ecology Institute branch station on the summit of Mount Kaindi in northeastern New Guinea, individuals of the weevil *Gymnopholus lichenifer* Gressitt have been marked and released for some years, while others were kept in large cages and also numbered with waterproof paint. Up to now, four different individual weevils have been monitored for three years or more. Changes in plant growth during the three-year periods have not always been very dramatic, giving good evidence that most weevils live much longer.

Often quite eroded-looking weevils are found. They have no mature plant growth and no scales on them. Through a combination of drying, fighting, mating or pushing through undergrowth between host trees, the scales together with the attached plants could be peeled off.

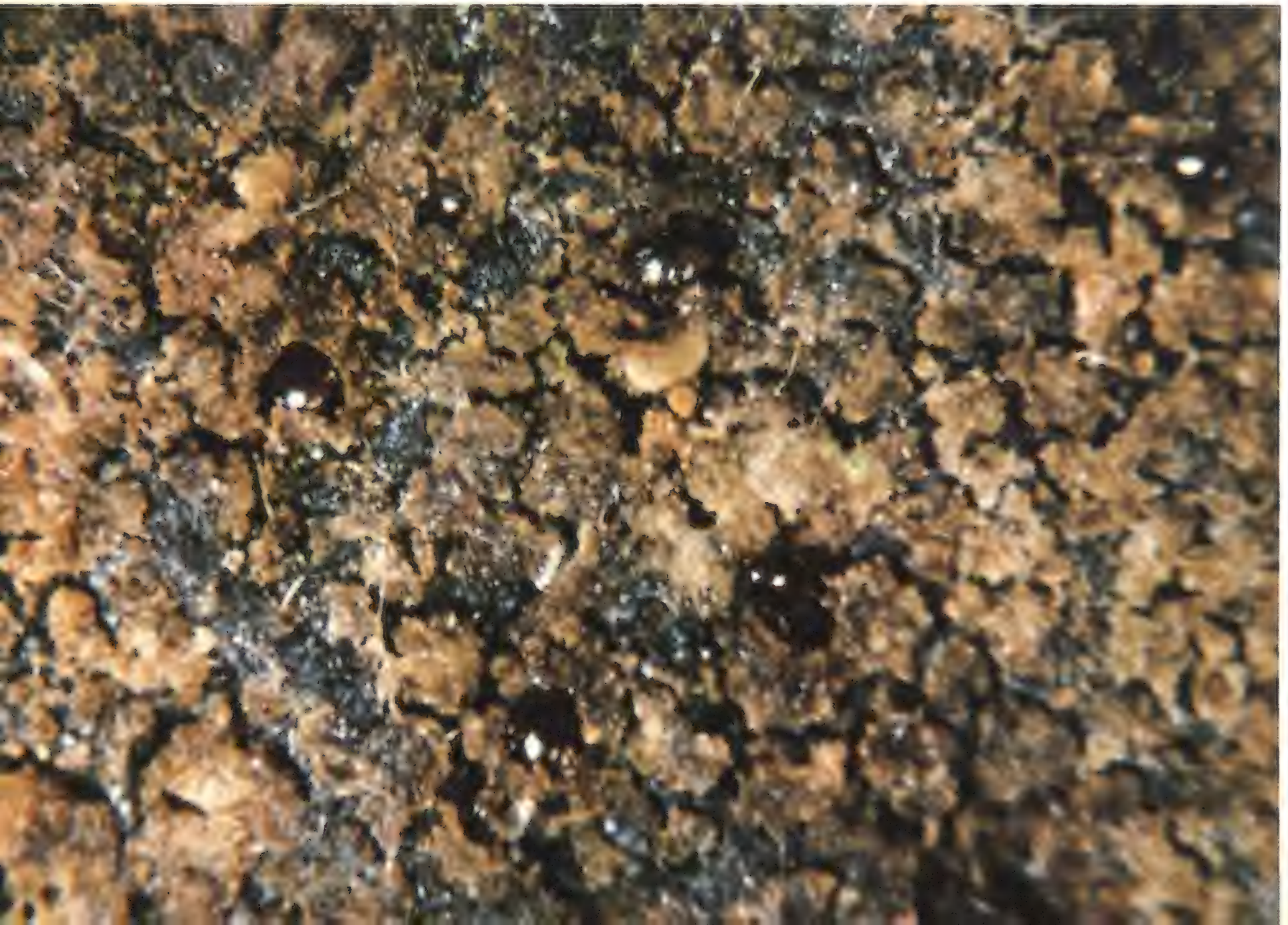
Plant growth on the New Guinea weevils is presumably initiated by windborne spores or transport of spores by mites or other cohabitants. A sticky secretion apparently traps the spores that come in contact with the weevil's exoskeletons. Transfer of mites, nematodes, rotifers and other animals between weevils must be aided by the fact that the two sexes of the weevil remain together a considerable part of the time, the males simply riding on the females' backs when not actually mating. Exchanges of symbionts are no doubt fostered this way.

When the weather is sunny, the weevils usually hang upside down on the undersides of leaves, thus giving shade to the gardens on their backs. When it is foggy, cloudy or drizzling, the weevils may climb about, going to the top shoot of a shrub or tree, or from one plant to another over the ground. They do not travel a great deal, however, and may remain on the same branch or sprig of leaves for some days.

Apparently this association includes the only known cases of liverworts, mosses and rotifers growing on living animals, the only lichens on living animals other than the Galápagos tortoises, and the only known scavengers, predators and plant feeders living among plants growing on terrestrial insects.

The longevity and sedentary nature of the weevils, plus the continuous high humidity of the environment, seem to be the crucial factors and may serve as the initial keys to understanding how this remarkable symbiosis developed.

Black plant-eating mites graze on lichens and fungi growing on the back of a weevil, *Gymnopholus algifer,* found high in the Owen Stanley Mountains.



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Book reviews

Eisenstaedt's Album: Fifty Years of Friends and Acquaintances
(A Studio Book, The Viking Press, $16.95)

By the nature of the work, photographers engaged in the craft of journalism move around a good deal; you cannot be there —wherever it is, and it is everywhere— unless they are. Of the notable names in this century's record of remarkable photojournalists, Alfred Eisenstaedt has probably moved around more, and with more appetite, relish and energy, than most.

His motion has been not only geographically latitudinous but societally vertical as well. Not only has he spanned the Earth in miles but he has traveled upward in its social hierarchies. It's hard to think of anyone you've ever heard of, including many you wish you hadn't, upon whom Eisenstaedt hasn't focused.

He is, of course, sublimely intuitive and a master technician. You may expect, on the evidence of decades of fine work, that a story shot by Eisenstaedt will show you what the thing looks like in its most revealing and clarifying aspects. He was an assistant to the great Erich Soloman and was a veteran photographer when he became a charter member of the magazine *Life*, which introduced the world to his kind of candid 35mm camera-work.

Eisenstaedt's work has been published in a number of books, hung on museum and gallery walls, been the subject of all sorts of international awards. It is not that journalistic aspect of it that he has chosen to gather in this human garden of a book, complete with some (according to one's taste) stinkweeds. Most of them, though, are adornments. Here is Michèle Morgan rehearsing, and Dorothy Mc-

Guire, for some unaccountable reason standing at an easel. Ah, ladies, how bright you are. Edna St. Vincent Millay, her candle burnt at both ends; Marlene Dietrich at her most, a whole lot. Here is Ferenc Molnar, ponderous, huge, sitting in a theater seat, his trousers cut well up over his chest—a minatory Molnar, a model for Erich von Stroheim.

These are photographs of people you have heard of before. They are either famous or accomplished, mostly both: at least one emperor (Hirohito), a Führer (Adolf), a shah (you know), kings, queens and lesser royalty. There is hardly a field of human endeavor of which Eisenstaedt has not met the leaders. What makes these pictures distinctive, considering whom they are of, is their informality. There are some, poor things, who cannot be informal (Bernard Shaw, for instance) but they are rare among the more than 400 black-and-white photographs presented here, most of them accompanied by personally inscribed messages to "Eisie" (who of course was ready to give his autograph in turn).

Hamming it up in Hollywood: "Eisie" as Groucho. Makeup by Wally Westmore.

The chronological range is extensive; 50 years of people met everywhere are presented in an album format which makes it all relaxed and irresistibly engaging. It is a pleasure to leaf around in it. To turn just a few pages: W. H. Auden, Jonas Salk, Louis Armstrong, Cordell

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PA22

Hull, Carole Lombard, Ronald Colman (who's Ronald Colman, Mommy?), Bertrand Russell, T. S. Eliot, George C. Marshall, Jacques Maritain, Lawrence Olivier, Richard Avedon (he should make others look so good). And, and. It is to enjoy.
—Bennett Schiff
Board of Editors

Rise, and Fight Again: Perilous Times along the Road to Independence
Charles Bracelen Flood
(Dodd, Mead and Company, $12.95)

Critical times when the hope of victory was far less evident than defeat are evoked in this account of several precarious episodes of the American Revolution.

"I think the game is pretty nearly up." Such a remark sounds alien to our concept of George Washington, yet this was his view during one particularly depressing period of discouragement.

Rise, and Fight Again reminds us of bleak days, difficult days, in our history. The title as well as the tone of the volume are drawn from Nathanael Greene's observation: "We fight, get beat, rise, and fight again." So runs the classic American legend of the underdog—a tradition which is not always woven into romanticized versions of the Colonies' revolt against the British Crown.

Charles Bracelen Flood, novelist and former war correspondent in Vietnam, has shown that two aspects of our national experience—the bitter taste of defeat (not mitigated at the moment by sure knowledge of eventual victory), followed by the vindication of a noble cause—can mutually reinforce an appreciation of America's beginnings. As the author explains, he has chosen "to tell of four catastrophic American defeats of the Revolution, and to show the spirit that overcame such disasters and won the final victory."

The four main episodes presented are:

1. The disastrous march to and siege of Quebec, involving Benedict Arnold while he was still a loyal American officer, which ended in the failure of an ambitious plan to conquer Canada.

2. The ignominious loss of nearly 3,000 men—one-fourth of Washington's entire field Army—at Fort Washington, New York, in one day, through unfortunate decisions of Nathanael Greene.

3. The Penobscot Expedition in the North (the present state of Maine), in

which eight British vessels inflicted a disproportionate amount of damage on American ships and troops, partly through the negligence of one Lieutenant Colonel Paul Revere, who was accused of being preoccupied with his own comfort.

4. The Battle of Camden, South Carolina, where Horatio Gates, hero of Saratoga, allegedly fled from the battlefield along with many of his beaten and panic-stricken troops.

In the course of these descriptions of disaster, Flood presents vignettes of individual lives in crisis. He makes the point that, as in all wars, the men involved rarely see the big picture but only understand the events in their own limited sphere of vision (see *Agincourt*, SMITHSONIAN, November 1976).

This book is, indeed, a distinctive addition to military history and a tribute to those who turned despair and defeat, eventually, to the final victory. The author is equal to this task, both as a forceful writer and a careful historian.

—Earl B. Braly
Former English professor at Texas Tech

Lost Wild Worlds: The Story of Extinct and Vanishing Wildlife of the Eastern Hemisphere
Robert M. McClung, with illustrations by Bob Hines
(William Morrow, $8.95)

That our civilization is heading toward various possible calamities is evident. One that could prove its undoing would be disenchantment and despair by those on whose abilities conscience and faith civilization depends. If such disenchantment prevails, a contributing element will surely be the devastation we have wrought in the unimaginably rich, planet-wide biological garden in which our species came into existence, to which it owes everything.

In *Lost Wild Worlds*, Robert M. McClung extends geographically the account he began in *Lost Wild America* of Man's depredations against the other animals. His story starts with Cro-Magnon man, to whose hunting skills "the skeletonal remains of some one thousand or more mammoths found at Predmost, Czechoslovakia, and great bone heaps near Solutré, France, containing the remains of many thousands of horses" give "awesome proof." He may have been the cause of

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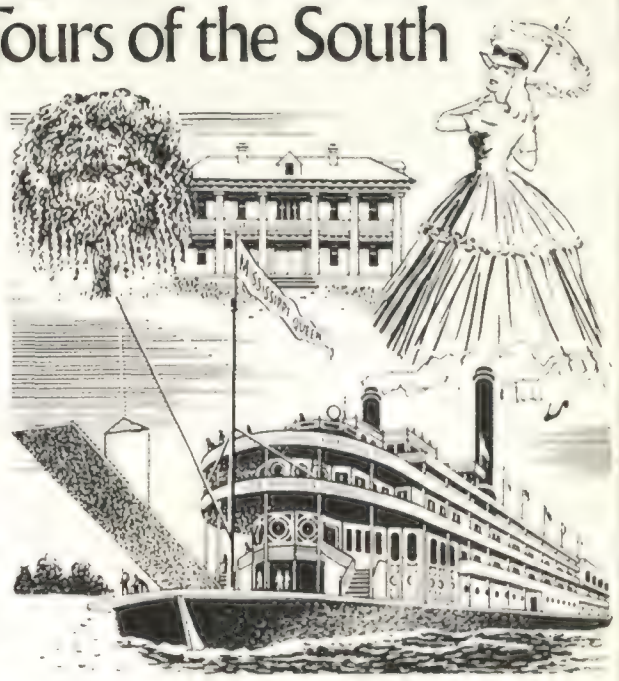

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the Pleistocene mammals' extinction. And we are his heirs, with better weapons. McClung points to Lord Ripon, who died in 1923, having killed 500,000 birds and mammals; to the maharajah who complained in 1965, "My total bag of tigers is only 1,150" (the author adds that "the species may well have disappeared completely from the wild by the year 2000"); and to the Australian rancher who recently boasted of having killed 20,000 kangaroos in four years.

Then there are the gunmen who have fanned out across the Arabian deserts in

In Madagascar, the *Aye-Aye*

Jeeps and trucks to mow down every living thing. It is no wonder that the beautiful Arabian oryx has disappeared, except for some small stocks in captivity—fortunately breeding.

Through shooting and destruction of habitat, the decline in animal numbers throughout the Old World has been precipitous, carrying to the verge of extinction or beyond such dramatic creatures as the Spanish imperial eagle, Congo peacock, Philippine Monkey-eating eagle, several species of rhinoceros, the lovely snow leopard, musk deer, giant sable antelope and Asiatic lion. In the Mascarene Islands (Indian Ocean), 90 percent of the native birds are believed exterminated. The slaughter of the vast herds of saiga antelope of the Eurasian steppes and of the wild horse of the South African veldt, called the quagga, recall the concurrent fate of the American bison—except that the quagga was wiped out.

McClung's recital is by no means wholly depressing, however. If 150 million small birds are being killed annually in southern Europe, most of them slaughtered in Italy for food, human beings have also been laboring to save endangered species—and redeem our own race: organizations like the World Wildlife Fund; the founders and keepers of na-

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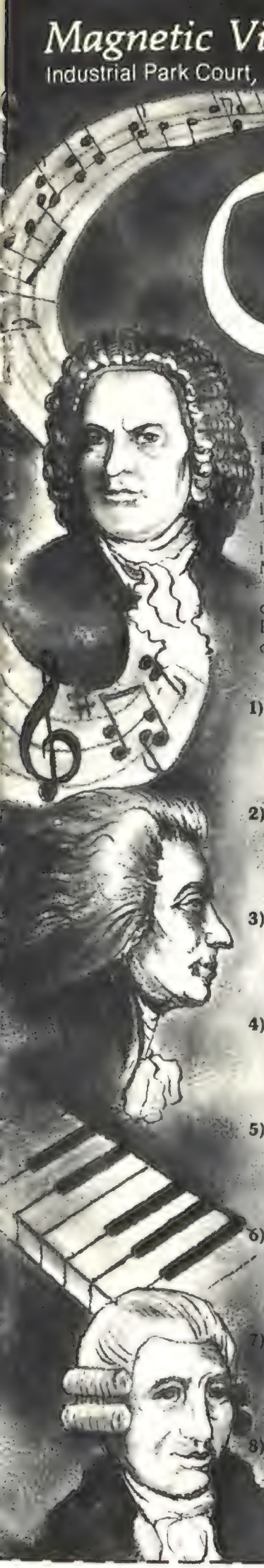

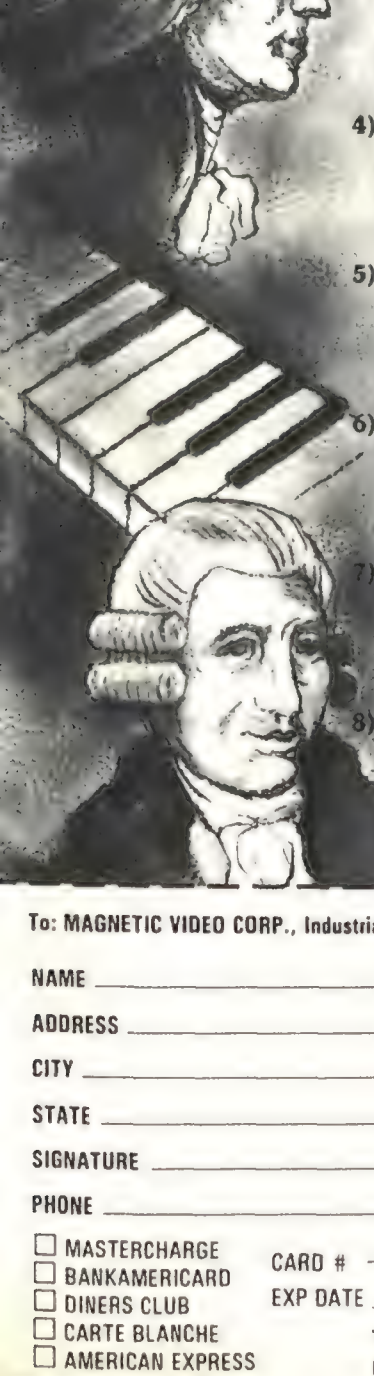

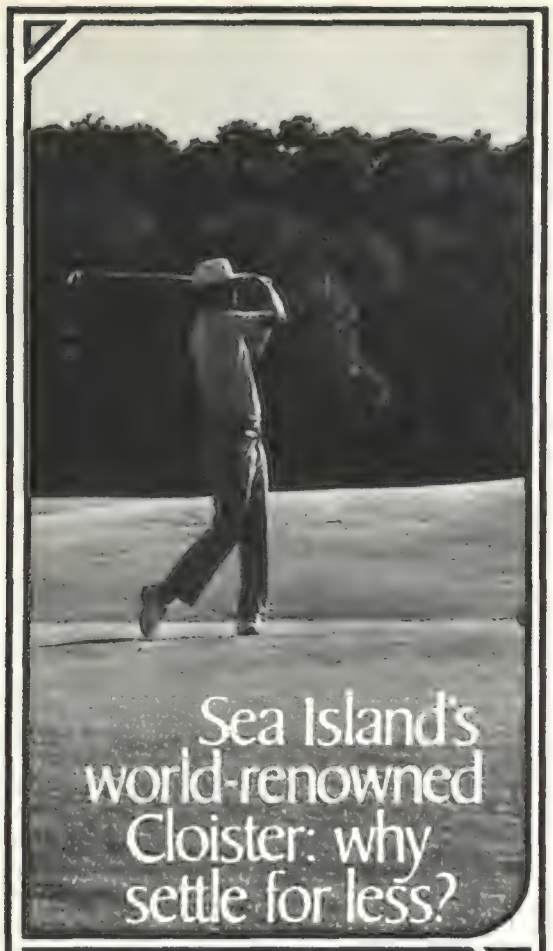

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tional parks, refuges and zoos; individuals who have bred a few survivors in captivity, such as the Duke of Bedford, who on his own saved Père David's deer and Przewalski's wild horse.

The wisent or European bison, European ibex, saiga, bontebok and blesbok antelope, among others, have been snatched from extinction. For many species, preservation in captivity seems the only hope, and with the encroachment of farming populations on remaining wild areas, the number may be greater than we like to think. For all our fellow creatures, the word should be: keep them alive no matter how, until Man, either through his reformation or chastisement, stops undoing the work of Creation and balance is restored to the Earth.

McClung has organized his material in the form of sketches of Man's involvement in the four continents that he deals with, followed in each case by individual accounts of their endangered and extinct species. These are so interestingly told throughout as to make the book highly readable, despite its somber tone. Bob Hines' drawings of many species add greatly to its value and appeal.

—Charlton Ogburn

Author, *The Winter Beach* and *The Adventure of Birds* (SMITHSONIAN, September 1976)

Handbook of North American Birds,
Volumes 2 and 3, *Waterfowl*
Edited by Ralph S. Palmer
(Yale University Press, $30 each)

For many years American ornithologists have felt the need for an authoritative handbook (in the German sense—compendium) on North American birds. In addition to professional ornithologists, there are now so many workers in government bureaus at state and federal level who need to know about birds, so many environmentalists, and such legions of knowledgeable bird watchers, that an "everything-you-ever-wanted-to-know-about-birds" book is overdue. And Palmer's *Handbook* is certainly the answer.

Palmer's first encyclopedic volume, published in 1962, covered 81 species of some 600 all told that occur on our continent north of Mexico and on offshore islands east to Greenland. These two volumes contain 1,081 pages and cover some 64 species of the waterfowl tribe in

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our area (including one species extinct since about 1878).

This is the sort of task which we expect university presses to face without flinching. Knowing Ralph Palmer well, I am sure he is not in the least daunted. For these books have his stamp all over them. He is listed as "editor," but to me he seems much more "the onlie begetter," which is a necessity in a work of this kind where judgments on details of every nature constantly have to be made.

One of the aspects of waterfowl as a family, which everyone since Heinroth in the early years of this century has admitted, is their susceptibility to acute and valuable observation in captivity. This is an area which is largely overlooked in these volumes. Palmer is not experienced with ducks and geese in captivity, so he naturally fails to give weight to the observations of many who have had such experience—from Glover Allan and John C. Phillips onward to Jean Delacour and Paul Johnsgard. For many of these observers, characteristics in the living bird are revealed that have value in determining relationships. Factors that may be submerged in specimen study, and not apparent simply through measurements or color variations, sometimes derive a new significance when observed in the living bird.

One aspect of vital difference among the waterfowl is the close family, clanlike behavior of goose species, compared with duck species. Thus, with geese, separation into small breeding populations tends to invest these birds with behavioral as well as physical characteristics. In the case of the widely spread species of the Canada Goose, for example, those like myself who have kept the different populations in captivity have noticed many things about the breeding behavior, calls and aggressiveness of these populations that museum specimens do not reveal. I wish that Palmer had thought of the factor of live observation in captivity and consulted a bit more with these authorities.

Thus, in the case of the Dusky or "Western" Canada, so-called, the presence of two types—the smaller, more northern darker form, and the larger, more southern-ranging, slightly paler form, which he merges into one subspecies—can well be upheld on the basis of their behavior. The northern population

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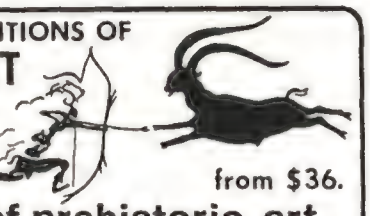

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which I would for these reasons, plus marginal size differences, distinguish as a separate subspecies, is, in life, distinctly darker, more delicately built, with a musical, higher-pitched voice, and is docile, getting on well with other forms of geese. The larger, coarser, more southern bird, the Vancouver Canada, is, as Delacour relates, very aggressive, has a raucous, harsh voice, and exhibits a markedly different personality as well.

It may be years before another *Handbook* is written. And it may be years before ornithologists manage to decide what a discrete population or subspecies is in fact. But no ornithologist should overlook the occasionally accurate observations of the aviculturist, any more than the occasionally highly accurate sight records or range extensions of the keenest bird observers are overlooked.

The illustrations, especially of downy young waterfowl, by Coleen H. Nelson, are very well rendered, although as anyone knows who has handled downy young, there is considerable variation in shadings and colors among individuals, and, I often think, variations more pronounced in different years. Robert M. Mengel has again provided sketches and plates as he did in 1962, this time improved, I feel. The maps, which are largely Palmer's work, are excellent, synthesizing much data, difficult to assemble and subject to endless fluctuations as nesting populations ebb and flow across the continent.

One disappointment to myself is that the state of Hawaii is not included in the range of the *Handbook*. While this may be a concession to some ancient tradition on the part of American ornithologists, Hawaii is a state, its avifauna has many affinities to that of the mainland, and it is now visited by so many bird watchers, and so well documented recently by Professor Andrew Berger and others, that I cannot see the sense in excluding its birds. Besides, so many Hawaiian birds are on the verge of extinction that this rather neglected responsibility of ours from a conservation point of view might have been emphasized had Ralph Palmer fixed his eye on the issues involved.

Expensive or not, these new Palmer volumes are the *sine qua non*, mines of information for every student of American birds.

—S. Dillon Ripley
Author and ornithologist

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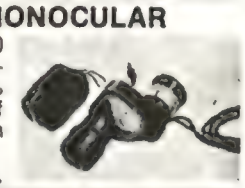

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The Porpoise Watcher by Kenneth S. Norris, W. W. Norton & Company, Inc., 1974

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Sir Nikolaus Pevsner (p. 96)

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Chilkoot Pass (p. 106)

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Alaska Northwest Publishing Company (Anchorage), 1973

One Man's Gold Rush by Murray Morgan, University of Washington Press, 1967

The Klondike Fever by Pierre Berton, Alfred A. Knopf, Inc., 1975

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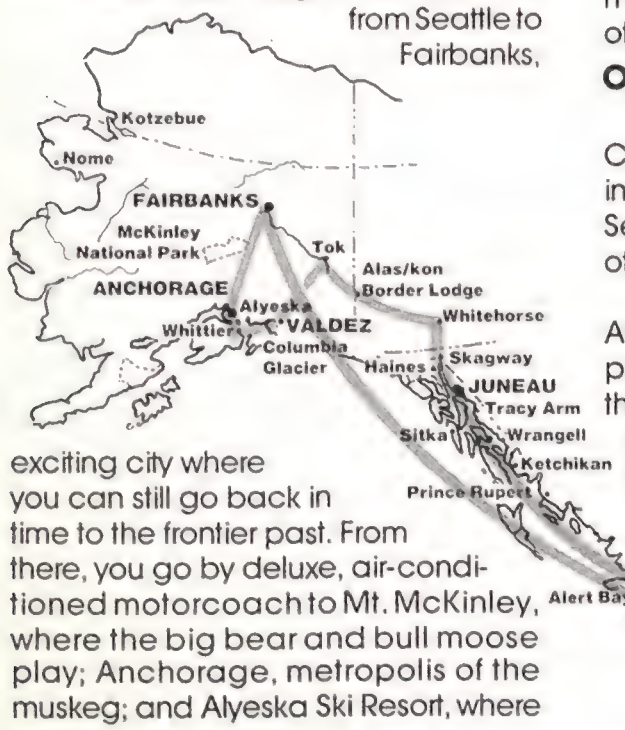

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Smithsonian highlights

Museum of Natural History

A new "Naturalist Center" (see p. 22, July 1976) has opened Wednesday through Saturday from 10:30 A.M. to 4 P.M. and on Sunday from noon to 5 P.M. The experimental center offers keenly interested amateur naturalists an opportunity to sit down and study Smithsonian natural history materials. Microscopes, scientific tools to dissect materials, and equipment to press and mount specimens are available. For additional information, call (202) 381-6204.

"Native American People" presents photographs by Susanne Anderson, author and photographer of *Song of the Earth's Spirit*. Her pictures capture intimate expressive moments of the Hopi, Kwakiutl and Miccansukki without violating the privacy of the individual. A concurrent show, "Native Americans: 500 Years After" presents photographs by Joseph C. Farber depicting native Americans as they live today—through February 25.

Museum of History and Technology

"Celebrating a Century," a documentary film complementing the "1876" exhibition in the Arts and Industries Building, is shown at 11:30 A.M. Mondays, Wednesdays and Thursdays.

Hirshhorn Museum and Sculpture Garden

"Fourteen Canadians: A Critic's Choice" presents works by 13 painters and one sculptor, reflecting the most vital work being produced in Canada today. It includes abstract color field paintings, semi-abstract works, landscapes and wood sculpture—opens February 3.

National Collection of Fine Arts
"Daniel Chester French: An American Sculptor" (see p. 54) presents 55 works, from small plaster studies to larger-than-life bronzes. French was America's most prolific sculptor of public monuments during the period between the 1876 Philadelphia Centennial and the outbreak of World War I—opens February 11.

"China Revisited: Ink Paintings by Thomas George" presents impressions, mostly of mountain landscapes, from the author's second trip to the People's Republic of China—opens February 18.

Renwick Gallery
"Paint on Wood: Decorated American Furniture Since the 17th Century" surveys three centuries of a style of furniture that relies primarily on paint for decorative effect. Fifty-five chairs, tables, china closets, chests, mirrors, benches, desks and trunks illustrate such decorative techniques as freehand-painting, graining, smoke graining, staining, and gilding—opens February 25.

Divisions of Performing Arts and Musical Instruments
- "The Swing Trombones," with Vic Dickenson and Benny Morton, is the February Jazz Connoisseur concert, February 13, 6 P.M. Hirshhorn Auditorium.
- The Music from Marlboro series presents a program of Mozart, Schubert and Hummel, February 19, 5:30 P.M., Baird Auditorium, Museum of Natural History.
- The Division of Musical Instruments brings the Kuyken Quartet to Washington in a program of Bach, Telemann, Muthel and Couperin, February 21, 8:30 P.M., Hall of Musical Instruments, Museum of History and Technology.
- Lester Flatt and Josh Graves play in the Country Guitar series, February 27, 8 P.M., Baird Auditorium.
- The Oberlin Baroque Ensemble is featured in the Musical Instruments series, February 28, 8:30 P.M., Hall of Musical Instruments, Museum of History and Technology.

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Musical Weekend in May

The sixth annual Musical Weekend co-sponsored by the Division of Performing Arts and Friends of Music at the Smithsonian is scheduled May 13-15 (see p. 120, January issue). For reservations write: Musical Weekend, Museum of History and Technology, Room 4123, Washington, D.C. 20560.

Smithsonian Institution
Traveling Exhibition Service

In commemoration of Black History Month, SITES is circulating copies of five major exhibitions:

• "Blacks in the Westward Movement" surveys the role of blacks in the westward expansion of the United States. It is shown February 19-March 20 in Newark, New Jersey, at New Jersey Institute of Technology; Albuquerque, New Mexico, at Museum of Albuquerque; Birmingham, Alabama, at Birmingham State College; Springfield, Missouri, at Southwest Missouri State College.

• "Frederick Douglass," a biography of the black emancipator, is shown January 22-February 20 in Cedar Rapids, Iowa, at Cedar Rapids Community Schools; Detroit, Michigan, at Detroit Historical Society; San Bernardino, California, at Homart Development Corporation; Fort Valley, Georgia, at Fort Valley State College; Gainesville, Florida, at Institute of Black Culture.

• "Black Presence in the Era of the American Revolution" is on exhibit February 1-March 20 in Detroit, Michigan, at Detroit Historical Society; January 22-February 20 in Middletown, Pennsylvania, at Penn State; February 5-March 6 in Bluefield, West Virginia, at Bluefield State College.

• "James Weldon Johnson" tells the story of this impressive NAACP figure who struggled for racial equality during first half of the 20th century. It is on view January 29-February 27 in Wytheville, Virginia, at Wytheville Community College, and in Macomb, Illinois, at Western Illinois University.

• "Hey! Look at Me," a collection of drawings and poetry by schoolchildren in the District of Columbia, portraying an upbeat image of their environment, is exhibited February 12-March 13, Miami, Florida, at Miami-Dade Community College; Eureka, Illinois, at Eureka College; Battle Creek, Michigan, at School District of City of Battle Creek.

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For information on bringing a show to your community write: SITES, Smithsonian Institution, Washington, D.C. 20560.

Regional Program in Seattle

The regional activities of the Smithsonian National Associate Program come to Seattle in March. Smithsonian events in the city include:

- The Smithsonian Chamber Players perform baroque, classical and early romantic music on instruments of the period and conduct workshops on instrument making.
- Smithsonian film maker and photographer Kjell Sandved, creator of the photography show "Art in Nature," lectures and conducts photography workshops.
- Charles Millard, chief curator of the Hirshhorn Museum and Sculpture Garden, presents a lecture on the collection.
- Marc Pachter, National Portrait Gallery historian and originator of the Bicentennial exhibit "Abroad in America" presents an illustrated lecture.
- Herman Viola, director of the National Anthropological Archives, discusses his latest book, *The Indian Legacy of Charles Bird King.*
- The Smithsonian's Family Folklore Center focuses on the impact of family folklore on cultural history in an exhibition lecture and series of interviews with local Associates.

National Associates in the Seattle area should have received invitations by this time. For further information, write National Associate Program, Smithsonian Institution, Washington, D.C. 20560 or call (202) 381-6491.

Cooper-Hewitt Museum

The Smithsonian's Cooper-Hewitt Museum in New York (see pp. 72-79, November issue) sponsors a widely varied educational program for adults and children. It includes classes, weekend seminars, craft workshops, furniture repair clinics and

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Travel Benefits for Smithsonian Associates

Three different categories of travel are available to Smithsonian Associates. For a brief description of Foreign Study, Domestic Study and Foreign Charter tours, see the July issue. Tours are announced exclusively in SMITHSONIAN. Write addresses below for additional information about a specific trip.

Foreign Study Tours

Jordan-Jerusalem—March 8-21: Archaeology in Jordan for one week; two weeks of historic sites in and near Jerusalem (accommodations and study at St. George's College) • **Russia**—June 1-22: Emphasizing art history in Georgia and Armenia • **Baltic, Norway and the Fjords**—July 30-August 18: Cruise on the *Argonaut* to Sweden, Estonia, Russia (Leningrad), Finland; spend a week in the fjords of Norway • **The Isles of Britain**—August 19-September 3: Cruise aboard the *Argonaut* from Edinburgh at Festival time to the Orkney, Hebrides and Scilly islands, Northumbria, northern Scotland and Wales • Write Miss Bliss Schumann, Foreign Study Tours, SI 123, Smithsonian Institution, Washington, D.C. 20560 or call (202) 381-5520.

Foreign Charter Tours

Australia and Tahiti—April 11-May 5: Sydney, Melbourne, Canberra and Papeete; "lifeseeing" seminars and excursions into the countryside; choice of side trip to Great Barrier Reef, or Adelaide overland to Alice Springs, or Tasmania and Southern Australia (originates in San Francisco) • **Istanbul and Asiatic Turkey***—April 18-May 2 or October 10-24: An adventure tour featuring the royal treasury and collections at Topkapi Palace, the Blue Mosque, an evening in a Turkish home and a cruise on the Bosphorus. Select an excursion to Aegean Turkey including Troy and Pergamum, an important Greek and Roman city near Ephesus; the Turquoise Coast with its dramatic mountain scenery, ancient Roman ruins and medieval castles on the sea; or central Anatolia and Cappadocia with its exciting rugged landscape, old caravansary and the unbelievable valley of underground houses and churches that was the center of the Byzantine anchorite movement • **Russia***—May 9-23 or October 3-17: The Bolshoi, Moscow Circus, Hermitage; schools, factories and housing in Moscow, Leningrad and Tallinn • **Poland***—May 16-30: An unusual and fascinating experience including the ancient Baroque city of Cracow, the magnificent tapestry collection in Wawel Castle dating from the Romanesque period, and the romantic birthplace of Chopin. Visit the enchanting fishing village where Copernicus spent 20 years of his life and produced his most important work, and make a pilgrimage to the Jasna Gora Monastery with the famous high altar of Our Lady of Czestochowa • **Paris and Provence***—May 23-June 6, September 26-October 10: Paris plus Avignon, Arles, Nîmes and Aix-en-Provence; museum seminars at the Louvre and Jeu de Paume; walking tours, excursions to the Loire, Chartres and Vaucluse • **Great Britain***—July 25-August 8 or September 12-26: The National Gallery, the British Museum, Tate, Victoria and Albert; London walking tours; choice of excursions to the English countryside; the best of London theater • **Mexico City and Yucatan**—November 4-15 or November 19-30: A study program in Mexico City concentrating on Aztec and Toltec cultures; visits to the Mayan ruins of Chichén-Itzá, Uxmal and Palenque (originates in Mexico City) • Low cost of tours includes first-class hotels, most meals, sightseeing, lectures, theater tickets and air fare. Foreign tours are heavily subscribed, so write early for additional details concerning a specific trip to Smithsonian Associates Travel Program, A&I 1270B, Smithsonian Institution, Washington, D.C. or call (202) 381-5635 for information. *Optional predeparture courses will be available for those who are interested.

Domestic Study Tours

NASA Weekend—March 25-27: Special program with museum curators to explore the galleries of the new Air and Space Museum • **San Antonio Festival**—April 21-29: Enjoy a colorful celebration highlighting the blend of Anglo and Spanish cultures in this historic city; also visit the hill country around La Grange and Austin, including the LBJ Library and Ranch • **Chesapeake Bay Cruise**—May 7-14: View the scenic and historic bay from the deck of the *Independence* cruise ship with land excursions to Annapolis, St. Michaels, Smith Island, Williamsburg and St. Marys City • **Grand Canyon Adventure**—May 20-30 or June 3-13: An exciting trip on the Colorado River with emphasis on ecology in May and river adventure history in June • **Yosemite High Country**—June 4-13: Explore high back country, under guidance of Yosemite Institute staff, in small groups suited to individual interests and hiking ability • **Washington "Anytime" Weekend**—Visit the nation's capital and tour the original Smithsonian building. Spend two night at Loew's L'Enfant Plaza Hotel (reservations required ten days prior to weekend) • Write Associates Travel Program, A & I 1270B, Smithsonian Institution, Washington, D.C. 20560 or call (202) 381-5635 for information.

luncheon talks by New York designers. Special study tours, with an emphasis on the decorative arts, are also offered. For educational information, call (212) 860-6868. For information about tours and joining the Cooper-Hewitt, call (212) 860-2011. Members of the Cooper-Hewitt are entitled to discounts on classes and other museum activities. Smithsonian National Associates do not receive such discounts but are admitted free to the Museum upon presentation of an Associate's card.

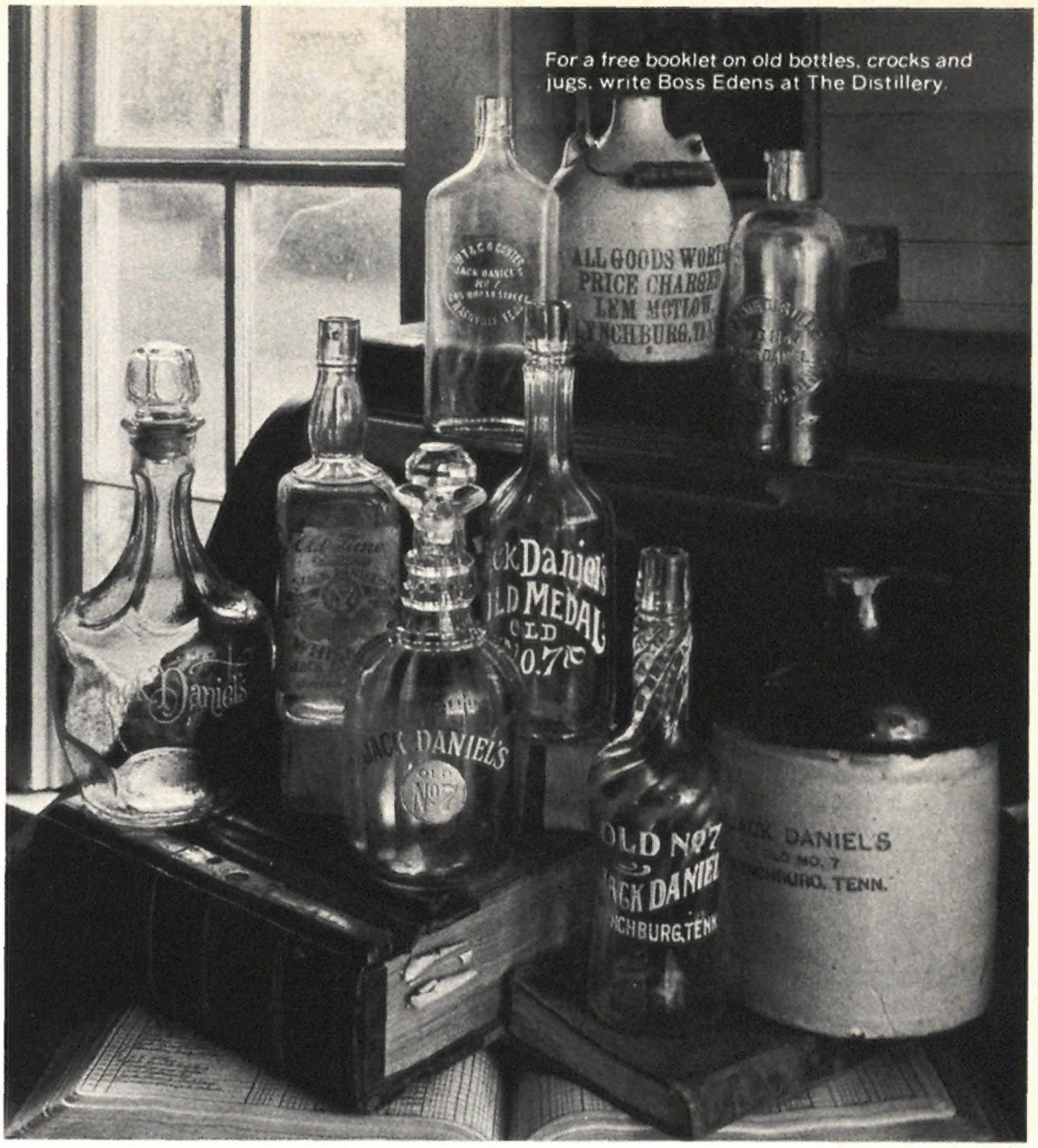
Anacostia Neighborhood Museum
"The Anacostia Story: 1608-1930" reconstructs the history of the community, demonstrates some analogies between early and contemporary history and defines the relationship between Anacostia and the Federal City. The project, involving three years of research and organization, includes the participation of community citizens through oral histories. Photographs, memorabilia, documents, artifacts and silkscreen text panels complete the show—opens February 13.

Special to Smithsonian Associates
Upon arrival at the Smithsonian, members are invited to register at the Associates Reception Desk, located in the Smithsonian castle on the Mall. Here, from 10 A.M. to 4 P.M., seven days a week, a special orientation packet may be obtained from a staff prepared to assist you. A lounge area is also located in this building.

Luncheon is available to Associates seven days a week in The Court, the new dining room for members, located on the ground floor of the Museum of Natural History.

Associates planning a future trip to the Smithsonian may write or call for advance information: Associates Reception Center, Smithsonian Institution, Washington, D.C., 20560; telephone (202) 381-6264. Lists of museums in the original 13 states may be obtained by writing the Museum Reference Service at the same address.

If you have misplaced your membership card, the Associate Receptionist in the castle will be happy to issue a replacement upon presentation of your SMITHSONIAN magazine address label. Membership cards are required for luncheon in The Court and discounts in the museum shops.



THESE OLD BOTTLES go back to the days when Jack Daniel made them to observe special occasions.

One was for winning the Gold Medal at the 1904 World's Fair. And another, in 1896, on the 100th anniversary of Tennessee statehood. He even had his nephew make a special bottle for his favorite hotel, the Maxwell House, in Nashville.
But when it came to whiskey, Mr. Jack insisted on charcoal mellowing every drop. He was too good a whiskey man to change that, no matter what the occasion.

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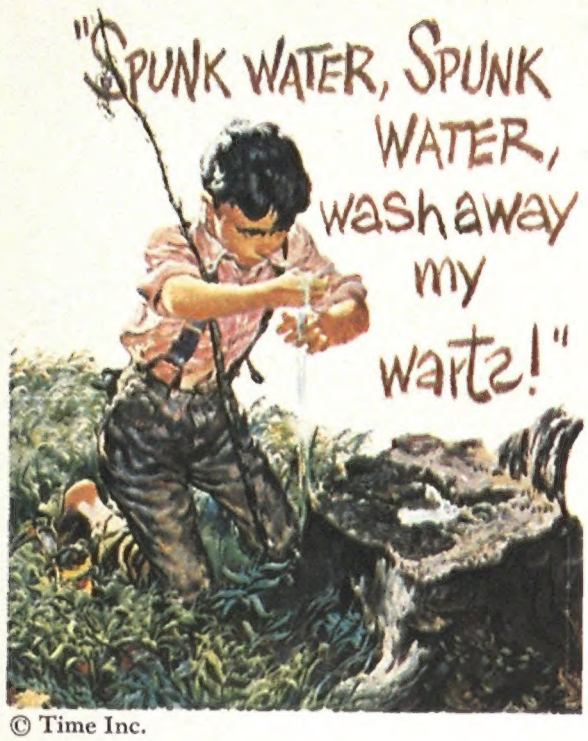

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By Patrick Ryan

Warts still defy spunk water and more scientific cures

Contemplation of the ubiquitous wart breeds wonder as to whether it might not be an affliction imposed with the divine intent of ensuring that our doctors do not develop delusions of omnipotence.

Utter medical humility certainly was displayed by dermatologists at the University of Cincinnati when they announced that after a 20-year study of warts, they were no nearer finding a satisfactory cure than when they started. Although the scientists concluded that the verrucae are produced by a polyoma virus, a highly contagious carrier, they confessed that they weren't really much further advanced than Hippocrates in suggesting reasons for the incidence of warts or nostrums for their cure. This leaves orthodox doctors with the customary resort only to treatments such as caustic painting, freezing or electrocautery.

Warts, like love and happiness, tend to come and go at their own volition. Their evanescence has ever made them a target for old wives' charms and autosuggestive cures. And such folk medicine doesn't seem to have progressed any better down the decades than that of the professional practitioners. Pliny the Elder, in the First century A.D., advised afflicted Romans to touch each of their nodules with a pea, wrap the peas in a cloth, and throw the parcel away behind them. The magical theory was the symbolic transference of evil in which the person picking up the package would pick up warts as well.

In the 16th century, when Francis Bacon was a young man visiting Paris, a great crop of warts sprang up on his hands. The British ambassador's wife cured him by rubbing the blemishes with a piece of fat bacon, which she then nailed to the outside of her window frame. As the bacon rotted away, so did Bacon's warts diminish, and in five weeks he was cleared of the lot. This type of parallel sorcery is one of the most widely used methods of wart banishment, although it is common practice now to set the touching object into moldering decay by burying it in the ground—be it, or they, copper coins, sliced potato, elderberry twigs, halved apples, raw beef, or wool yarn knotted with the number of warts.

Pretty well everything else relatively unpleasant has been hailed by someone as the sovereign remedy for warts. A sample selection of sure-fire anointments from geography and history covers eel's skin, snails, ink, dandelion juice, a dead man's hand, castor oil, waking spittle, and—but only in May—the tail of a tortoiseshell cat. Also silver polish, laundry bleach, a vegetable diet and deep thought.

Among the more fanciful treatments, the people of Cornwall have lived up to their fey reputation by advising sufferers to catch the moon's rays in a metal bowl and wash clean their decorated hands in the pool of reflected beams. The popularity of *Tom Sawyer* has led to widespread reliance among rural and verrucose Americans on Tom Sawyer's prescription of sprinkling with "spunk water." A curious quirk about the proclaimed success of this rainwater scooped up from a tree stump in the woods, is that some authorities hold that its wonder-working title of spunk water never even existed in the American language until Mark Twain dreamed it up.

Down in Kentucky where I'm led to believe they tend to come as spooky as the Cornishmen, the wart-laden put their faith in the occult powers of old mountain ladies who are reputed to be able to remove epidermal excrescences merely by touching them. Something of a similar trust prevails in Ireland, although the one there with the healing gift at his fingertips must be a seventh son. It is also traditionally held over there that a victim can be made smooth again if sprinkled with water from a holy well.

Before anyone scoffs too wildly at these outlandish rituals, note should be taken that such treatment by suggestion has become dignified by the medical profession. It was used successfully by the University of Cincinnati researchers when they asked suggestible children to make a tracing of their affected hand or foot. The drawing was then solemnly burned, and the artist told that the warts would vanish in a few weeks. And they usually did so. Other researchers in New York found support for such a folklore method when they found that the wart population among schoolchildren was reduced dramatically when the nodules were painted with a bright vegetable dye.

Transatlantic support for this psychic approach comes from a pharmacist in Birmingham, England. He kept a Wart Book in his shop and local tradition advised that if you were afflicted, you should visit him, but only on a Wednesday, and never use the words "please" or "thank you." Your name, the number of unwanted warts and their position on your body were then written down in the book, and you would be told to go away and forget them. And presto, as I've been assured by a customer, your warts would depart. It worked, one might say, like a charm.

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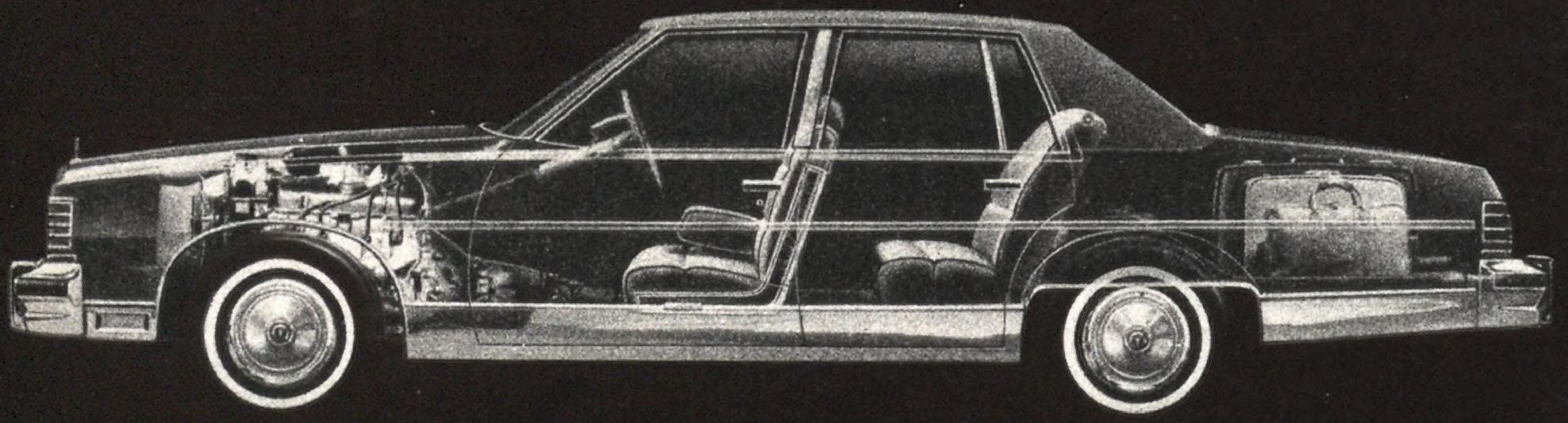

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